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ERRATA

VOLUME XXV

page 317 line 20 for 'NIELSON' read 'NIELSEN'

VOLUME XXX

84 49 for 'MESCHER' read 'MIESCHER'
300 43 delete 'pea mosaic virus'
353 31 for 'SHEMA (E. F.)' read 'SHEMA (B. F.)'
657 9 insert '*Phragmidium violaceum* on, in Norway, 166'
662 28 delete '*Phragmidium violaceum* on, in Norway, 166'

VOLUME XXXI

25 45–46 for 'Meded. Landb. Hoogesch. Wageningen' read 'Meded. Hoogesch. Gent.'
183 31 for 'Trumple' read 'Trumble'
305 30 for '30' read '31'
397 44 for 'Zweigstrauchvirose' read 'Zwergstrauchvirose'
571 48 for '533' read '535'
654 37 after 'WILSON J. D.' delete '8, 437, 493, 624, 634'

VOLUME XXXII

84 8 for 'LEYENDECKER (P. L.)' read 'LEYENDECKER (P. J.)'
114 47 after '*Pseudomonas*' insert '*medicaginis* f.sp.'
118 10 for 'Bamia' read 'bamia [*Hibiscus esculentus*]'
139, 140 49, 1 for 'cyclopoldic' read 'cyclopaldic'
141 50 for 'Lancashire' read 'S. Wales'
146 26 for 'Azda' read 'Azad'
176 27 for 'albolinium' read 'albolineum'
183, 184 42, 3 for 'albolenum' read 'albolineum'
206 25 for 'potato leaf roll virus' read 'potato nutritional leaf roll'
26 delete '[*R.A.M.*, 31, p. 571]'
272 28 for '*tulipiferae*' read '*tulipiferus*'
380 39 for '*oxycanthae*' read '*oxyacanthae*'
386 17 for '318' read '319'
391 6 for '*spodoleucos*' read '*spodoleucus*'
401 38 for '*phaseoli-radiata*' read '*phaseoli-radiati*'
416 24 for '*sojensis*' read '*sojense*'
424 28 for '*bacterium*' read '*Bacterium*'
445 35 for 'ever' read 'every'
446 51 for 'early' read 'late'
52 for 'late susceptible, the early' read 'early susceptible, the main-crop'

page 484 line 17 for '*Tagetus*' read '*Tagetes*'
516 17 for '*Pratylenchus*' read '*Anguillulina*'
528 33 for 'No. 263' read 'No. 261'
539 11 after '*Pseudomonas*' insert '*medicaginis* f.sp.'
36 for 'J. Hus' read 'P. Hus'
545 6 insert '[*Cerotelium*]' after '*Kuehneola*'
561 21 for 'varieties of mistletoe [*Phoradendron*]' read 'the variety Mistletoe'
591 12 insert '[*Melampsorella*]' after '*Melampsora*'
600 36 for '32' read '31'
616 28 for '*wellmani*' read '*wellmanii*'
617 5 for '*lachrymans*' read '*lacrymans*'.
618 11 for 'lower than' read 'of'
648 48 for 'bacterial' read 'bactericidal'
667 16 for 'mistletoe' read 'scion of the variety Mistletoe'
676 39 for '*stewartii*' read '*stewarti*'
687 41 for 'Stessel (J. G.)' read 'Stessel (G. J.)'

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REVIEW
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RENNERFELT (E.) & STARKENBERG (B.). **Träskyddskommitténs fält-och rötkammarförsök. Redogörelse No. II.** [Field and decay-chamber experiments of the Timber Preservation Committee. Report No. II.]—*Medd. SkogsforsknInst. Stockh.*, 40 (*1951*), 4, pp. 1–13, 2 figs., 2 graphs, 1952. [English summary.]

In continuation of the previous report on official Swedish experiments in timber preservation [*R.A.M.*, 29, p. 546], the results for the seven years up to May, 1950, are summarized. All the untreated stakes in the accelerated field test plots were extensively rotted. Tanalith U was less effective in the prevention of decay than Boliden salt, while the highest resistance was shown by the stakes treated with creosote. Similar results were obtained with poles.

In field tests with sapwood stakes all the untreated samples were decayed, their average period of durability being estimated at 3·3 years. The stakes treated with all the above-mentioned preservatives were more or less severely decayed, whereas those impregnated with copper sulphate by the Boucherie process [ibid., 31, p. 93] were still sound.

Most of the untreated stakes and poles in a mine test were too rotten for further service, but all those treated with tanalith U, Boliden salt, or creosote were in good condition.

In the greenhouse decay chamber the stakes rotted about twice as fast as in the field, and both treated and untreated samples were uniformly disintegrated.

FINHOLT (R. W.), WEEKS (M.), & HATHAWAY (C.). **New theory on wood preservation.** —*Industr. Engng Chem.* (*Industr.*), 44, 1, pp. 101–105, 3 graphs, 1952.

A new theory of wood preservation against fungi is outlined, postulating that fungicidal materials have two fundamental modes of action, one inside and the other outside the cell membrane. Substances of the former group are held to be limited to about a 12-carbon chain length irrespective of water solubility, while those of the latter, which may act by denaturing the cellulolytic enzymes secreted by the hyphae, may be either water-soluble or insoluble. Support for these postulates is based mainly on comparative toxicity determinations by the agar-dish and soil-block methods [*R.A.M.*, 31, p. 215] on a series of normal alcohols and amines.

Using the agar-dish method, the apparent inhibition points for the fungus Madison 517 [*Polyporus tulipiferus*] of alcohols containing 6, 8, 10, 11, 12, 14, 16, and 18 atoms were 0·09, 0·014, 0·009, for the first three, respectively, and over 5 for the rest, and for Madison 534 (*Lentinus lepideus*) 0·13, 0·023, 0·004, 0·0045, 0·3, and over 5 for 14, 16, 18 atoms. For *P. tulipiferus* the apparent inhibition points of amines containing 8, 10, 12, 14, 16, and 18 atoms were 0·08, 0·05, 0·09, 0·5, over 5, and over 5, respectively, and for *L. lepideus* 0·066, 0·042, 0·027, 0·038, 0·42, and 0·6, respectively.

GRIFFIOEN (K.). **An experiment with impregnated sleepers in an Indonesian railroad track.**—*Tectona*, 41, 3–4, pp. 157–178, 1 fig., 1 diag., 1951. [Indonesian summary.]

A tabulated account is given of experiments in the impregnation of railway sleepers of *Dipterocarpus trinervis*, *Schima noronhae*, and *Palaquium* sp. in Indonesia. The investigation, initiated in 1929, was interrupted by the war in 1942, but the advantage of the use of treated material had already been clearly demonstrated, and it was further shown that the expensive pure creosote could safely be replaced by cheaper creosote-residue mixtures, thereby reducing the percentage of the former ingredient to 15, without impairing its preservative action. The estimated average lifetime of the treated sleepers was 14 years, as compared with just over two for the untreated.

INOUE (Y.) & KUROKI (Y.). **Wood preservatives. VII. The efficiency of the wood preservatives with chlorinated Pine-root oil.**—*Mokuzai Kenkyu* (*Wood Res.*) 8, pp. 74–82, 1952. [Abs. in *Chem. Abstr.*, 46, 15, p. 7272, 1952.]

At Kyoto University, Japan, samples of several species of wood were treated with chlorinated pine root oil [*R.A.M.*, 31, p. 156], creosote coal tar, pentachlorophenol, and sodium pentachlorophenate [ibid., 31, p. 311] prior to inoculation with *Irpex consors* and *Lenzites subferruginea*. The antiseptic effect of the compounds, determined three months later by compressive intensity tests, followed the foregoing order, except that after one month's growth of the fungi sodium pentachlorophenate exerted the most powerful action. It is important to protect the fungicides against leaching and evaporation.

BOULTON (E. H. B.). **The identification and treatment of defects in timber—Part II.**—*Estate Mag.*, 42, 3, pp. 109–111, 1952.

Notes are given on the moisture requirements, life-history, detection, and control of *Merulius lacrymans* [*R.A.M.*, 31, pp. 41, 154] causing dry rot in buildings.

HÖPNER (T.). **Pilzschäden am Zellstoffholz.** [Fungal damage on pulpwood.]—*Papier*, 6, 3–4, pp. 47–53, 15 figs., 1952.

Following a brief survey of the literature on the nature and essential requirements of wood-destroying fungi, the author describes his studies at the Central Laboratory of the Cellulose Works, Aschaffenburg, Germany, on the distribution of hyphae [of unspecified fungi] in spruce wood, the occlusion of cells in the marginal zone of the invaded areas, and the processes of dissolution in the individual fibres and the fibre mass. Four diagnostic characters may be used for detecting pulps prepared from rotted wood, namely, the presence of hyphae in the lumina of the fibres, perforation of the fibre wall, large numbers of tracheids plugged with granular resin, and fibres filled with a dark-coloured, gelatinous substance. Changes in the wood substance were followed by comparative determinations of the colour, specific gravity, copper number, alkali solubility, yields in sulphite cooks, and chemical and mechanical properties of sound and infected samples.

JACKS (H.). **Seed disinfection. 1. Preliminary selection of vegetable-seed protectants.**—*N.Z. J. Sci. Tech.*, Sect. A, 33, 3, pp. 27–38, 3 figs., 1951.

Much of this information on the evaluation of a number of seed protectants on various vegetable seeds [mostly carried out at the Imperial College of Science and Technology, London] has already been noticed from another source [*R.A.M.*, 31, p. 264]. Samples of Imperial lettuce seed on malt agar each inoculated with one of the following, *Alternaria solani*, *Rhizoctonia* [*Corticium*] *solani* [ibid., 31, p. 270],

and *Botrytis cinerea* [loc. cit.], and treated with thiram still gave 100 per cent. germination (untreated 75, 77·8, and 11·1, respectively), and also after inoculation with either of the two first-named or *Fusarium solani* and treated with 36L [ibid., 31, p. 264]. Certain well known fungicides gave no protection against *B. cinerea* under the conditions of the test. Complete germination was also secured when Laxton Superb pea seed inoculated with *Pythium debaryanum* and sown on soil agar was treated with cuprocide, spergon, panogen, thiram, ferbam, or 36L, or when sown on malt agar with panogen and thiram, and also when lettuce seed on soil agar similarly inoculated was treated with thiram or 36L.

Isolations from lettuce in glasshouse and field trials yielded, respectively, 41 and 36 per cent. *Pythium* spp., 60 and 20 per cent. *Fusarium* spp., 28 and 13 per cent. *Rhizoctonia* spp., and (in the field trials) 11 and 12 per cent. *Phoma* spp. and *Alternaria* spp., respectively. Peas yielded in the two trials 34 and 44 *Pythium*, 61 and 42 *Fusarium* [see below, p. 5], and 22 and 20 per cent. *Rhizoctonia*, respectively, and 12 per cent. *Phoma* in the field trials. The high incidence of the first three in diseased tissues suggests that they are the main causes of seed rotting and damping-off of seedlings.

MacFarlane (I.). **Factors affecting the survival of Plasmodiophora brassicae Wor. in the soil and its assessment by a host test.**—*Ann. appl. Biol.*, 39, 2, pp. 239–256, 3 graphs, 1952.

At Rothamsted Experimental Station, Harpenden, Herts., the activity of *Plasmodiophora brassicae* in the soil [*R.A.M.*, 29, p. 247; 31, pp. 171, 216] was measured simultaneously by counting root hair infections on cabbage seedlings and assessing the percentage of clubbing on older plants. There was a linear relation between the logarithms of the mean number of root hair infections per seedling and of the spore concentration in the inoculum. A high proportion of clubbed roots was associated with very low average numbers of root hair infections on seedlings. The percentage of clubbed plants may be used for a quantitative assessment of soil infestation by *P. brassicae* only at lower levels of infestation than can counts of root hair infections.

Experiments on the survival of resting spores in a wet, acid soil demonstrated a rapid decline in numbers of infections to a low and nearly constant level as the time from inoculation increased. This decline was delayed considerably by alkaline or dry soil conditions or by the addition of mustard oil (allyl isothiocyanate).

Possible improvement of the sampling design in experiments using the root hair infection count technique is discussed briefly.

McLean (D. M.). **Occurrence of yellow-net virus disease in table Beet seed plants in northwestern Washington.**—*Plant Dis. Reptr*, 36, 6, pp. 241–242, 1952. [Multilithed.]

Beet yellow-net virus disease [*R.A.M.*, 31, p. 97], similar to the yellow-net reported from California [ibid., 28, p. 105] and believed to be caused by the same virus, was found in table beet seed plants in an experimental planting at the Northwestern Washington Experiment Station, Mount Vernon, in 1951. The stecklings had been grown in 1950 in two locations well isolated from the general seed-producing area. The disease was subsequently found in steckling beds in two areas. The virus was readily transmitted to garden beets, sugar beets, Swiss chard (*Beta vulgaris* var. *cicla*), and mangold [loc. cit.] by five to ten infectious aphids (*Myzus persicae*) [ibid., 30, p. 209] and easily separated from the mosaic virus [ibid., 29, p. 131] in the California sugar beet virus complex by a post-infection fasting of three hours or more, or by retransferring viruliferous aphids from sugar beet to any of the suscepts after three hours.

Baldoni (R.) & Canova (A.). **Un metodo per il rapido riconoscimento dei semi di Barbabietola infettati da Phoma betae (Oud.) Frank.** [A method for the rapid detection of infection by *Phoma betae* (Oud.) Frank on Sugar Beet seeds.]—*Ann. Sper. agr.*, N.S., 6, pp. 435–442, 1952. [English summary.]

The following method for the detection of *Phoma betae* [*R.A.M.*, 30, p. 596; 31, p. 415] on sugar beet seeds was developed at the Experimental Laboratory of Plant Pathology, and the Seed Analysis Laboratory, Bologna, Italy. Dried lucerne leaf tissue, previously sterilized with propylene oxide [ibid., 27, p. 189], is mixed with liquid agar in Petri dishes, sown with the fruit clusters, and incubated for eight days at 20° C. The fructifications develop abundantly, particularly on the lucerne tissue and are easily visible by transmitted light. The advantages of this method are its ability to indicate infections normally invisible under the microscope, and to facilitate the rapid inspection of numerous dishes by an inexperienced operative.

Zhukova (Mme. K. P.). Влияние кислотности и вляжности почвы на поражаемость ростков Сахарной Свеклы возбудителями корнееда. **(Pythium de Baryanum H. и Phoma betae Fr.).** [The effect of the acidity and moisture content of the soil on the infection of Sugar Beet seedlings by root rot agents (*Pythium debaryanum* Hesse and *Phoma betae* Frank.)]—Докл. Акад. сельскохоз. Наук Ленина [*Proc. Lenin Acad. agric. Sci.*], 16, 5, pp. 34–38, 1951.

Studies at the Pan-Soviet Institute of Beet Culture, U.S.S.R., on the changes in the growth cycle and degree of infection of sugar beets affected by root rot (*Pythium debaryanum* [cf. *R.A.M.*, 31, pp. 161, 449] and *Phoma betae* [ibid., 23, p. 465]) have shown that the activity of the former pathogen (artificially introduced into the soil) increases from 25·3 killed plants to 100 per cent. with the increase in soil acidity from pH 6·4 to 7·2 and moisture from 60 to 90 per cent. at 17° to 25° C. The coincident rhythm of development of both *P. debaryanum* and the beet plant indicates the high adaptability of the fungus to its host. Infection by *Phoma betae* (artificial seed-borne infection) was more vigorous on weakened seedlings at low soil moisture. Its influence is not very serious as the fungus is seed-borne and can easily be removed by seed treatment. Soil acidity does not play an essential part in the development of the disease. Seed treatment is not so effective against *P. debaryanum* and draining the soil and shallow cultivation before and after emergence are recommended for its control.

Koch (L. W.) & Hildebrand (A. A.). **An occurrence of a gummosis of Sugar Beet in Ontario in 1951.**—*Plant Dis. Reptr*, 36, 5, pp. 198–199, 1 fig., 1952. [Multilithed.]

In 1951 at the Canada and Dominion Sugar Company the normal sugar beet processing operations were obstructed by clogging of the filters by a mucilaginous exudate. Investigations at the Laboratory of Plant Pathology, Harrow, Ontario, showed the roots to be almost black and disintegrated at the tips, with a strong odour of acetic acid and exuding globules of a frothy, viscous fluid. Sectioning revealed brownish, discoloured tissues and lacuna-like cavities that soon filled with fluid. A similar condition was produced in the laboratory, in healthy roots that had been frozen and thawed, when fluid from affected beets was transferred to them; non-frozen roots remained healthy. The condition is probably identical with that described by Simon in Belgium (*Publ. Inst. belge Amélior. Better.*, 19, pp. 21–25, 1951) and is due to the action of certain [unspecified] bacteria on roots that have been left to freeze and thaw between harvesting and delivery to the factory.

Boron deficiency [*R.A.M.*, 30, p. 75] is attracting increasing attention in Ontario every year and many beets in the storage piles were affected by heart rot.

CRUICKSHANK (I. A. M.). **Fusarium-foot-rot of Peas in New Zealand.**—*N.Z. J. Sci. Tech.*, Sect. A, 33, 3, pp. 62–65, 3 figs., 1951.

Fusarium foot rot (*F. solani* var. *martii* f. 2) [*R.A.M.*, 30, pp. 20, 299] affects pea crops in Canterbury, Marlborough, Hawkes Bay, and Auckland, New Zealand, other characteristic symptoms being seed decay, pre-emergence rot, and seedling rot [see above, p. 3]. Each of the twenty-one varieties tested was susceptible. Seed dressings at 1 and 2 oz. per bushel with spergon, phygon, arasan, N[ew] I[mproved] ceresan, agrosan GN, nomersan, and cupric carbonate failed to give control [ibid., 31, p. 44].

CONROY (R. J.) & WILSON (R. D.). **Mottle leaf of Tweed Wonder Beans.**—*J. Aust. Inst. agric. Sci.*, 18, 1, pp. 33–38, 2 figs., 1952.

In New South Wales the term 'mottle leaf' is applied to a seed-transmitted, non-infectious, variegated leaf condition of Tweed Wonder beans (*Phaseolus vulgaris*), first observed five or six years ago. Of the two distinct strains of Tweed Wonder, Tenterfield is virtually free from the condition, whereas up to 40 per cent. of South Coast plants are affected. Similar symptoms have been observed in Canadian Wonder.

On Tweed Wonder the primary leaves may be affected, mottling varying from a few scattered, yellow patches to a general yellowing. On trifoliate leaves, one or more leaflets may display a few small islands of yellow or white tissue, imparting a speckled appearance to the leaf, or a greater portion of a leaflet may be discoloured with only a few smaller islands of green; the affected areas are often sharply delimited by the larger veins, producing a characteristic sectored effect. Growth retardation in mottled sections is followed by leaflet distortion resembling that described by Zaumeyer [*R.A.M.*, 21, p. 359]; where all three leaflets of a leaf are mottled distortion and recurving of the midribs is less common than when only one or two are affected.

Symptoms of 'dwarf mottle' (severe leaf yellowing, rosetting, and short internodes) sometimes occur; affected plants, however, often put out normal shoots with little or no mottling. There is no pod distortion [cf. loc. cit.]. Frequently, mottling of an individual plant is delayed, or in lightly affected plants masking of symptoms may occur, seed from symptomless plants giving rise to mottled ones.

In an experiment in which single plant progenies were grown in the greenhouse, the number of seeds from affected lines averaged 12·3 per plant, as against 21·5 for apparently healthy plants.

THOMAS (W. D.) & GRAHAM (R. W.). **Bacteria in apparently healthy Pinto Beans (a phytopathological note.)**—*Phytopathology*, 42, 4, p. 214, 1952.

Isolations on potato dextrose agar from the stem tissues of 50 apparently healthy Pinto bean (*Phaseolus vulgaris*) plants at the Colorado A and M College yielded the following bacteria [cf. *R.A.M.*, 27, p. 293]: *Xanthomonas phaseoli* [ibid., 31, p. 468] and its var. *fuscans* [ibid., 30, p. 502; 31, p. 3], *Corynebacterium flaccumfaciens* [ibid., 29, p. 600; 31, p. 416], *C. fimi*, *C. helvolum*, and a clostridial type closely akin to *Clostridium carbonei*. Only the three first-named proved to be pathogenic in inoculation tests.

The presence of pathogenic species in externally normal plants adds to the difficulty of controlling *Corynebacterium flaccumfaciens* and *X. phaseoli*. The expression of the wilt and blight symptoms associated, respectively, with these two organisms may have been inhibited by the cool weather preceding the isolations.

Gasiorkiewicz (E. C.), Larson (R. H.), Walker (J. C.), & Stahmann (M. A.). **Induced variability in Pyrenochaeta terrestris by nitrogen mustard.**—*Phytopathology*, 42, 4, pp. 183–192, 4 figs., 1952.

At the University of Wisconsin, Madison, induced variability in two natural isolates, one moderately pathogenic from Louisiana and the other mildly so from Wisconsin, of the onion pink root fungus, *Pyrenochaeta* (*Phoma*) *terrestris* [*R.A.M.*, 29, p. 134], was studied in relation to the possible origin of natural variation within the species, using nitrogen mustard [cf. ibid., 28, p. 610] according to the method of Stahmann and Stauffer (*Science*, 106, pp. 35–36, 1947).

The gas proved to be an effective mutagenic agent. No correlation was observed between type of mutants produced and the duration (up to 64 minutes) of exposure. Pathogenicity tests were performed in Wisconsin temperature tanks with four commercial varieties, Utah Sweet Spanish, Yellow Globe Danvers, Yellow Bermuda, and Excel, the two former being classed as susceptible and the two latter resistant on the basis of response to natural isolates. Through enhanced virulence some of the mutants derived from weak parental types were able to induce symptoms of the same order as those attributed to certain virulent natural isolates. Some mutants were much less virulent than the untreated isolates. Sporulation on the host in the greenhouse was no criterion of pathogenicity. Thus, sparsely sporulating strains could be equally virulent with those producing spores copiously. Disease indexes of mycelial lines varied between very low and moderately high. In general, the mutants obtained with the aid of nitrogen mustard fell within the descriptive and cultural range of the natural isolates.

It would appear from these results that new and more virulent variants of *P. terrestris* may arise through mutation from any of the existing strains.

Newhall (A. G.) & Rawlins (W. A.). **Control of Onion blast and mildew with carbamates.**—*Phytopathology*, 42, 4, pp. 212–214, 1952.

Particulars are given of recent experiments on 16 farms in six counties in New York State which resulted in the effective joint control of onion 'blast' [*R.A.M.*, 24, p. 48], mildew (*Peronospora destructor*) [ibid., 31, p. 268], and thrips by spraying or dusting [ibid., 11, p. 420] with nabam or zineb in conjunction with an insecticide, e.g., DDT or parathion. Although many growers prefer dusting to spraying, nine sprayed fields gave an average yield increase of 180 bags (31 per cent.) compared with 138 (22) for dusted ones. The control of 'blast' by the two fungicides, together with other information, suggests that fungi, hitherto regarded as unimportant, may be largely responsible for the disease.

Grogan (R. G.) & Snyder (W. C.). **The occurrence and pathological effects of Stemphylium radicinum on Carrots in California.**—*Phytopathology*, 42, 4, pp. 215–218, 3 figs., 1952.

A shorter account of this work has already been noticed [*R.A.M.*, 31, p. 164]. In California carrot seed crops are arranged to mature during the dry season, when leaf and umbel blight due to *Stemphylium radicinum* has not been observed. Roots transplanted for purposes of seed production are, however, frequently infected, and the spores carried on the roots or crowns may infest the seed during harvesting or threshing. The advisability of seed treatment is thus indicated.

Middleton (J. T.), Kendrick (J. B.), & Hall (B. J.). **Parasitic and non-parasitic diseases of Celery in southern California.**—*Plant Dis. Reptr*, 36, 5, pp. 188–193, 1952. [Multilithed.]

The occurrence, symptoms, and control of parasitic and non-parasitic diseases of celery present in the southern California growing region, which stretches from San

Louis Obispo to San Diego, are briefly described. Broadcast application of cyanamide (about 1,000 lb. per acre) to moist soil at least 15 days before transplanting gave satisfactory control of pink rot (*Sclerotinia sclerotiorum*) [*R.A.M.*, 30, p. 453], but when applied to celery strippings immediately after harvest it did not control the disease in the subsequent celery crop unless the land was fallowed in the interim. Foliage blight (*Septoria apii*) [ibid., 26, pp. 397, 441; 31, p. 264] is the most destructive and widespread disease on autumn and winter celery; 3–3–100 Bordeaux mixture plus Du Pont spreader sticker (4 oz.) or plus blood albumen ($\frac{1}{4}$ lb.) gave 92·4 and 87·3 per cent. control, respectively, compared with 45·1 and 85·2 per cent. control for Bordeaux alone at 3–3–100 and 6–6–100, respectively.

The recent occurrence of adaxial crack stem, or brown checking, in areas which have hitherto been free from it has been attributed to low rainfall, and to the use since 1943 of the variety Utah 10B, which appears to be more susceptible than Utah 16. The disorder, which may be related to abaxial crack stem caused by boron deficiency [ibid., 21, p. 442], is most prevalent in fields that have received excessive amounts of nitrogenous fertilizers. Symptoms are found only on the adaxial portion of the petiole. A central, watersoaked area 2 to 5 mm. long and 1 to 2 mm. wide with an irregular, wavy margin develops distally on the young petiole in the bud, increasing in length as the petiole elongates and turning yellow-brown; some of the tissue subsequently becomes necrotic, the margins appearing etched and dark brown or black; transverse checks and cracks develop and the affected area becomes corky. At Oceanside the disease caused serious crop loss in one field while no loss occurred in an adjacent field of the same variety on the same soil type where the plants were sprayed twice with borax at the rate of 10 lb. per acre [ibid., 20, p. 192].

Bud failure was observed on all the 10 celery varieties tested, the percentage being significantly higher in one accession of Utah 16 than in the rest; the disease was present in the absence of crack stem symptoms. It is concluded that bud failure may operate independently of boron deficiency, and that it may be genetically controlled and affected by seasonal or cultural factors. The percentage of split petiole in New Summer Pascal was 28·2 and in Summer Pascal 8·5, and none in all the other varieties tested. The disorder was apparently due to planting these types in seasons unsuitable for their normal development.

Fry (P. R.). **Lettuce mosaic.**—*N.Z. J. Sci. Tech.*, Sect. A, 33, 5, pp. 52–63, 4 figs., 1952.

A full account is given of work at the Department of Botany, Auckland University College, on lettuce mosaic virus in New Zealand [*R.A.M.*, 29, p. 454; 30, pp. 20, 362], including symptoms and host range. Further studies showed that the disease is now widespread locally. Inoculation of a winter crop of the Imperial 615 variety 81, 57, and 35 days before cutting gave average yields of 153, 215, and 269 gm., respectively, as compared with 316 gm. for the uninoculated. Infection at the seedling stage thus caused a reduction in crop weight of 51·6 per cent. Seed from infected plants was 6 to 15 per cent. infected and commercial seed lines had 2 to 3 per cent. infection [ibid., 31, p. 314]. The virus remained viable at a dilution of 1 in 7, withstood heating for ten minutes at 54° C. but not at 55°, remained infective in extracted sap stored at 23° for 24 but not 32 hours, and failed to pass an L1 Pasteur—Chamberland filter.

McKinney (H. H.). **Two strains of Tobacco-mosaic virus, one of which is seed-borne in an etch-immune pungent Pepper.**—*Plant Dis. Reptr*, 36, 5, pp. 184–187, 1952. [Multilithed.]

At the Plant Industry Station, Beltsville, Maryland, tobacco etch virus [*R.A.M.*, 31, p. 519] was frequently isolated from many collections of mottled leaves from

pungent and pimento [chilli] peppers. Potato veinbanding mosaic [potato virus Y: ibid., 31, p. 418] and the ring spot strain of potato virus X [ibid., 30, p. 548; 31, p. 520] were each isolated once, and a new virus, causing mild symptoms in Samsun tobacco suggestive of tobacco mild mosaic virus type 2 [ibid., 10, p. 60] but inducing no systemic infection in tomato, was isolated several times.

The new virus is named the South Carolina mild mottling strain of tobacco mosaic virus. Tested on *Datura stramonium* it had a dilution end-point in distilled water beyond 10^{-8}, a thermal death point in 10 minutes between 80° and 89° C., and was highly active in dried Samsun tobacco leaves after storage for 27 months at room temperatures.

The South Carolina pungent pepper No. 46252 is immune from tobacco etch virus collected in South Carolina and other States and inoculation with tobacco mosaic virus [ibid., 31, p. 418] or the mild mottling strain produced only local necrotic lesions over a wide range of temperatures.

Tobacco etch virus, potato virus Y, and a strain of tobacco mosaic virus characteristically latent in Samsun tobacco were extracted from mottled leaves of a pungent pepper plant. In S.C. No. 46252 the latent virus developed a strong light green mosaic mottling which resembled tobacco etch mosaic or tobacco mosaic virus in susceptible pepper lines. The latent strain differs from Holmes's masked strain of tobacco mosaic virus [ibid., 13, p. 399; 31, pp. 150, 518] in that it induces local necrotic lesions but is not systemic in *Nicotiana sylvestris*, increases locally but usually without symptoms and is not systemic in Rutgers tomato, and does not infect Scotia beans (*Phaseolus vulgaris*). Following the detection of the virus in non-inoculated S.C. 46252 plants affected with mosaic, seed was harvested from four of these plants and kept in a warm greenhouse for over three months. Only one of the infected plants failed to yield some progeny infected with the latent strain of tobacco mosaic virus, whereas all of the 24 plants grown from the seed of virus-free plants remained free from mosaic.

Spritzplan für den Weinbau 1952. Herausgegeben von der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. [Spray schedule for viticulture 1952. Issued by the Federal Experiment Station for Fruitgrowing, Viticulture, and Horticulture at Wädenswil.]—*Schweiz. Z. Obst- u. Weinb.*, 61, 7, pp. 134–135, 1952.

The sprays recommended for use in the Zürich district of Switzerland against the locally prevalent insect pests and fungous diseases [*R.A.M.*, 31, p. 315], the latter comprising rotbrenner [*Pseudopeziza tracheiphila*], downy mildew (*Peronospora*) [*Plasmopara viticola*: ibid., 31, p. 591], and mildew (*Oidium*) [*Uncinula necator*], are tabulated, with directions for the mode and time of application, and listed in alphabetical order [see next abstracts].

Blumer (S.). **Die Spritzungen gegen den falschen Mehltau (Peronospora) im Weinbau.** [Sprays against false mildew (*Peronospora*) in viticulture.]—*Schweiz. Z. Obst- u. Weinb.*, 61, 10, pp. 185–186, 1952.

The following sprays are authorized by the Federal Experiment Station, Wädenswil, for the control of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] in the Zürich district of Switzerland [see preceding and next abstracts]. Bordeaux mixture dusts for pre- and post-blossom use are supplied under the names of cupra, Hungerbühler, Siegfried, kukaka (Maag) [*R.A.M.*, 25, p. 536], and rekato (Muttenz); copper oxychloride dusts: blaukupfer 50 (Sandoz), bordofix 50 (Muttenz) [ibid., 21, p. 377], carbylkupfer 50 (Hungerbühler), coprantol P (Ciba), cuprovinol (Ob 21) [ibid., 30, p. 193] (Brändli), kupfer 50 Geigy, cupra, Grisard [ibid., 28, p. 461], Rohner, oxykupfer 50 (Siegfried), and virikupfer 50 (Maag) [ibid., 25, p. 536]:

copper oxychloride pastes: coprantol N (Ciba) and supercuprenox (Usar); copper oxide dusts (red copper): colloidal copper cupra, copper Sandoz, and red copper Maag; the copper carbonate cupromaag (Maag) [ibid., 28, p. 235]; the thiocarbamates M 555 (Maag) [ibid., 31, p. 275] and cuprosan (also containing copper); and the copper–sulphur mixture cuprosofril (Maag) for the simultaneous treatment of *P. viticola* and mildew [*Uncinula necator*]. With the exception of the Bordeaux mixtures, none of the foregoing should be used for post-blossom applications.

Schellenberg (A.). **Von den Kosten der Spritzmittel im Weinbau.** [Concerning the cost of sprays in viticulture.]—*Schweiz. Z. Obst- u. Weinb.*, 61, 7, p. 136, 1952.

According to the calculations of the four central spraying installations in the canton of Zürich, a total of 400 to 600 Swiss francs per ha. was expended in the summer of 1951 on copper-containing viticultural fungicides, the cost of which has risen nearly twofold during the past two years. At present prices the outlay on 100 l. Bordeaux mixture for the control of downy mildew [*Plasmopara viticola*: see preceding abstracts] is between Fr. 2 and Fr. 4·50, so that the question of the correct concentration assumes the utmost importance. In general, 1 per cent. suffices for pre- and 1·5 per cent. for post-blossom treatments. Experience has shown that frequent applications at lower dosages are more effective than a few at high concentrations. Another decisive factor is the volume of spray delivered, depending on nozzle diameter and pressure, the author's recommendations for which are 1 to 1·2 mm. and 15 to 25 atmospheres, respectively.

Lafon [J.]. **Le traitement du mildiou de la Vigne sans cuivre.** [The treatment of Vine mildew without copper.]—*C. R. Acad. Agric. Fr.*, 38, 4, pp. 148–150, 1952.

In a comparative test against vine mildew [*Plasmopara viticola*: cf. *R.A.M.*, 28, p. 437; 31, p. 167, and preceding abstracts] carried out in 1950 at the Station Viticole de Cognac, vines sprayed six times with 2 per cent. Bordeaux mixture and TP13 (0·5 per cent.) [ibid., 31, p. 477] gave, respectively, yields of 3·83 and 4·87 kg. per vine, as against 1·57 kg. for the unsprayed. In 1951, a year very favourable to infection, following nine applications of the two fungicides (TP13 at 2 to 2·5 per cent.) the yields were 2·15 and 4·09 kg. per vine, respectively, as compared with 0·75 kg. for the unsprayed. On 18th July the untreated and those sprayed with Bordeaux and TP13 had, respectively, 183, 106, and 42 lesions. The wood matured well on the treated plots. TP13 adhered moderately well. The duration of its efficacy appeared to be slightly less than that of Bordeaux mixture in 1950 but was approximately equal to it in 1951, when the final application was made on 23rd August, growth being much delayed. At pruning time the shoots on vines treated with TP13 appeared cleaner and of a better colour than those on the vines sprayed with Bordeaux mixture.

In a note (pp. 150–151) Lenglen refers to a paper by Moreau and Maury (*Viticulteur champenois*, January, 1951), in which they state that at the experimental station of Fort-Chabrol in 1951 satisfactory control of mildew was obtained with dithane Z-78, especially in damp, dull weather. In some experiments the treated vines appeared to show increased susceptibility to *Oidium* [*Uncinula necator*: cf. ibid., 30, p. 599; 31, pp. 102, 275, *et passim*].

Panjan (M.) & Lušin (Vera). **Ispitivanje natrijevog thiosulfata kao sredstva za zamjenu sumpora kod suzbijanja oidiuma.** [Tests with sodium thiosulphate as an alternative to sulphur for the control of Vine *Oidium*.]—*Zasht. Bilja* [*Plant Prot., Beograd*], *1952*, 10, pp. 42–48, 3 graphs, 1952. [German summary.]

From 1949 to 1951 experiments were carried out in Yugoslavia for testing the value of sodium thiosulphate as an alternative to sulphur for the control of vine

powdery mildew (*Uncinula necator*) [cf. *R.A.M.*, 31, pp. 48, 102]. The results of experiments at Rim, near Zagreb, have shown that one spray of 0·5 per cent. sodium thiosulphate plus 1 per cent. Bordeaux mixture followed by two sulphur sprays could serve as an alternative to three sulphur sprays, infection percentages for both schedules in 1949 being the same, i.e., 0·8; in 1951 they were 0·02 and 0·01, respectively, compared with 3·4 and 1·2 per cent. for the controls which had been treated entirely with Bordeaux mixture in both years. In another experiment in 1949 two sodium thiosulphate sprays plus one sulphur spray gave the best results (0·9 per cent. infection compared with 4·8 per cent. for the controls), though similar results were obtained with three sulphur sprays. Sodium thiosulphate appears to be more effective in wet years.

Bradley (R. H. E.). **Studies on the aphid transmission of a strain of Henbane mosaic virus.**—*Ann. appl. Biol.*, 39, 1, pp. 78–97, 1 graph, 1952.

At Rothamsted Experimental Station, Harpenden, Herts., a virus which caused a severe wilt of *Datura stramonium* at Oxford in 1948 and produced necrotic local lesions in *Nicotiana rustica* was identified as a strain of henbane mosaic virus [*R.A.M.*, 31, p. 169]. Local lesions were demonstrated in tobacco by staining with iodine. The duration of the feeding puncture by aphids (*Myzus persicae*) had no effect on the number of infections and very little on the percentage of insects becoming infective. It did not appear that transmissible virus was continually imbibed by aphids feeding on infected plants; there were indications that it was acquired immediately before the stylets were withdrawn from the leaf. Transmission occurred during feeding punctures of only 5 to 10 seconds, the probability of single punctures resulting in infection reaching a maximum at 20 to 30 seconds, during which the stylets did not penetrate to the centre of the epidermal cell and very little saliva appeared to be ejected.

Periods of darkness before inoculation with the *Datura* wilt isolate of henbane mosaic virus increased the susceptibility of *N. rustica* to infection by rubbing but not to infection by aphids.

Department of Agriculture, Kenya, Annual Report 1950. Vol. I.—38 pp., 1952.

In part II of this report [cf. *R.A.M.*, 31, p. 173], dealing with the policy and work of the Department of Agriculture (pp. 17–38), it is stated that all except one of the commonly grown established wheat varieties are susceptible to race K 9 of stem rust (*Puccinia graminis*) [ibid., 31, p. 481] and the resistance of some varieties to K 1 [loc. cit.] has apparently broken down, suggesting an increase in the virulence of K 1 or the occurrence of a new, similar form. The emergence of yet another new race, K 10, emphasizes the instability of the rust position.

In spraying experiments against coffee [physiological] leaf fall copper sprays applied in March and May at the Scott Agricultural Laboratories, Nairobi, and in July in the Solai district, where leaf fall occurs only during the September to January period, gave maximum control. Over three years Bordeaux mixture was the only treatment significantly affecting cherry weight, giving a difference from the untreated [a reduction], significant at the 5 per cent. level, in the 1950 yields.

The strawberry variety Royal Sovereign M. 40, which showed early promise at Molo, has proved susceptible to leaf spot [*Mycosphaerella fragariae*: ibid., 30, p. 309]. In plots of a single pyrethrum [*Chysanthemum cinerariifolium*] clone established on 33 farms the percentage of flowers affected by bud disease (*Ramularia bellunensis*) [ibid., 30, p. 308] in districts west of the Rift valley was double that occurring east of the Rift. There are indications that some strains are resistant [cf. ibid., 31, p. 423].

Of six potato varieties that had previously shown immunity from blight (*Phytophthora infestans*) [ibid., 30, p. 308], all were attacked in 1950, except 1512d. 4,

which is immune from biotypes A, B, C, E, and F [ibid., 31, p. 626]. Varieties immune from A, B, E, and F were apparently attacked by biotype C, and those immune from A and C by the new biotype E, first introduced from Tanganyika [ibid., 30, p. 510].

Cabbage black rot (*Xanthomonas campestris*) [C.M.I. map No. 136; *R.A.M.*, 29, p. 144] and a pineapple disease resembling brown speck, from which *Penicillium* sp. [ibid., 29, p. 160] and *Fusarium scirpi* [cf. loc. cit.] were isolated, are recorded for the first time in Kenya.

Åkerman (Å.). **Årsberättelse över Sveriges Utsädesförenings verksamhet år 1951.** [Annual report on the work of the Swedish Seed Association for the year 1951.] —*Sverig. Utsädesfören. Tidskr.*, 62, 3, pp. 219–285, 1 graph, 1952.

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, 23, p. 127]. The humid atmosphere prevailing in the Svalöf district of Sweden during July, 1951, favoured an epiphytotic of wheat black rust (*Puccinia graminis*) [*R.A.M.*, 31, p. 599], which developed with unexampled severity at the end of the month, simultaneously with an outbreak of brown rust (*P. triticina*) [ibid., 29, p. 150]. Most of the autumn-sown wheat varieties are susceptible to *P. graminis*, but a line derived from a cross between Atle and Äring I yielded 4,090 kg. seed per ha. or 45 per cent. more than the standard Eroica II; also relatively prolific were Trifolium 14 and three other selections from Eroica × Skandia. Among spring-sown wheats Fylgia was outstanding for resistance to black rust, giving a yield of 3,045 kg. per ha., while other productive varieties and selections included Fylgia II, Sv 48/657, Pondus, Dalalant, 01170b$_2$, 01172b, Ög 01140a, and Certus. At the Östergötland branch of the Association Skandia IIIB winter wheat showed the maximum degree of resistance to black rust, while Aros, Robut, and Odin also withstood the disease reasonably well. Resistant summer wheats included Fylgia, Hallands 'land' (both early), the medium-early Kärn II and Ög 01140, and the late Pondus. At Kalmar, too, Aros, Skandia III, Odin, Kärn II, Fylgia, and Ög 01140 were more or less resistant to *P. graminis*. At the Västgöta branch summer wheat was heavily infected by *Erysiphe graminis* [ibid., 30, pp. 360, 604], as well as by *P. graminis*. Kärn II and Ög 01140 gave the highest yields. In Värmland the black rust epiphytotic, described as 'catastrophic', reduced summer wheat production to insignificance; the least susceptible Dala yielded 1,628 kg. per ha. *Sclerotinia borealis* [ibid., 30, p. 44] was responsible for serious losses in the winter wheat crop in Västernorrland.

Autumn-sown cereals in Östergötland sustained heavy damage from *Fusarium nivale* [*Calonectria nivalis*: ibid., 31, p. 550], which was particularly severe on rye and wheat, and from *Typhula* [see below, p. 14]. Winter rape and colza were so severely attacked by *T. borealis* as to necessitate re-sowing in many fields. At Svalöf *Botrytis cinerea* was destructive to summer colza, whereas the earlier maturing rape entirely escaped damage from this source.

An intensive outbreak of potato blight (*Phytophthora* [*infestans*]) in Jämtland afforded an opportunity for the evaluation of resistance in different varieties [ibid., 31, p. 78], among which Sv 41127, Sv 42149, and Sv 43084 compared favourably in this respect with Early Puritan and Eva.

Patel (M. K.) & Kulkarni (Y. S.). **Nomenclature of bacterial plant pathogens.**— *Indian Phytopath.*, 4, 1, pp. 74–84, 1951.

The Eubacteriales [*R.A.M.*, 30, p. 145] are at present separated into families mostly on physiological grounds. The authors suggest, therefore, that all bacterial plant pathogens, which are distinguished by the fact that they attack plants only, should be placed in the family Phytobacteriaceae, embodying the seven genera exclusively reserved for these organisms. The genera are distinguished primarily by

the type of symptoms produced. *Xanthomonas* [ibid., 28, p. 273; 31, p. 9] may be regarded as truly a member of this family since the species incite necrosis of leaves, stems, and petioles. The genus *Phytobacterium* of Magrou and Prévot (*C.R. Acad. Sci., Paris*, 226, pp. 1229–1230, 1948), into which were separated white forms, chiefly producing leaf spot, is accepted for 16 species. *Chlorobacter* n.gen. is erected to accommodate plant pathogenic, leaf-spotting organisms producing a green fluorescent pigment, originally in *Pseudomonas*, which is reserved for saprophytic species. The type species is *C.* [*P.*] *syringae*. *Aplanobacter* [loc. cit.] originally including only plant pathogens is revived and emended to include six Gram-positive, non-motile, wilt-producing organisms, *Corynebacterium* [*R.A.M.*, 30, p. 145; 31, p. 56] being reserved for animal pathogens and saprophytes. *Agrobacterium* [ibid., 28, p. 273], with members inducing tumours and hairy roots, is transferred from the Rhizobiaceae, reserved for the nitrogen-fixing symbiotic bacteria. *Erwinia* [ibid., 31, p. 174] is retained for peritrichous plant pathogens causing blights and not attacking pectin, whereas *Pectobacterium* [ibid., 27, p. 514] is revived for soft-rot organisms digesting pectin and producing gas in several cases.

A list of new combinations is given and a table with the morphological and biochemical characters of the principal organisms, together with keys (a simple and a more detailed one) to the genera in the new family.

THOROLD (C. A.). **Airborne dispersal of Phytophthora palmivora, causing black-pod disease of Theobroma cacao.**—*Nature, Lond.*, 170, 4330, pp. 718–719, 1952.

Contrary to the results obtained by Salazar (abs. in *Cacao Inform. Bull.*, 1, 18, 1949) observations in Nigeria [*R.A.M.*, 30, p. 23 and next abstract] have indicated that sporangia of the black pod rot organism (*Phytophthora palmivora*) may be air-borne and that infection apparently results thereby. Sporangia were caught on vaselined cellophane disks fixed for 12-hour periods 5 to 20 mm. away from an infected pod, even when moisture was apparently absent. Small disks (3 mm. in diameter) were used because they were more suited to the low wind velocity ($\frac{1}{2}$ to 1 m.p.h.) prevailing locally.

Using Van der Plank's procedure [ibid., 26, p. 257], the distribution of black pod disease in cacao fields was examined by observing the number of doublets (pairs of infected trees) in sequences of trees. A tree is termed 'diseased' when it carries one or more infected pods and 'healthy' when it has none. Observations in the same field on two occasions indicated that such grouping as occurs, which may be due to spread from neighbour to neighbour, could occur by chance. The spread of disease from an infected tree with black pods heaped around the base was also studied by inspecting surrounding trees at various distances from the infection source on alternate days, recording the number of black pods and adding them to the heap. The results also suggested horizontal random distribution from a central source. Under local conditions there was no direct evidence of the natural production of *P. palmivora* sporangia from other hosts or on any part of the living cacao tree except the pods. As would be expected with an air-borne disease there was also evidence of vertical spread so that healthy pods became infected from diseased pods several feet below. Sporangia are probably commonly dispersed from infected pods in splash droplets, although take-off has been demonstrated in dry air. It appears that they may be air-borne for considerable distances. Casual observations indicate that infection is very rarely associated with insect punctures.

THOROLD (C. A.). **The epiphytes of Theobroma cacao in Nigeria in relation to the incidence of black-pod disease (Phytophthora palmivora).**—*J. Ecol.*, 40, 1, pp. 125–142, 3 maps, 1952.

Studies on cacao in Nigeria suggest that the severity of black pod disease (*Phytophthora palmivora*) [see preceding abstract] is governed by humidity con-

ditions which are probably related to rainfall differences. The mean annual rainfall in various parts of the cacao areas ranges from 45 in. to over 300 in. Of the epiphytes (listed) which occur on cacao in Nigeria, liverworts are found under relatively dry conditions, vascular plants require relatively wet conditions, and mosses are intermediate. On this basis seven categories of possible epiphyte occurrence are defined, mean epiphyte ratings being obtained by averaging the individual ratings for about 100 cacao trees.

Positive and significant correlations were found for mean epiphyte rating and rainfall, mean epiphyte rating and mean number of black pods per tree, and mean number of black pods per tree and mean number of total (healthy plus diseased) pods per tree. There was a significant, negative correlation between the mean epiphyte rating and mean number of total pods per tree.

Illumination was the only factor of importance affecting epiphytes and in the relatively dry areas they were suppressed when natural shade reduced the light to $\frac{1}{56}$ of full exposure illumination. In the wet areas they were little affected by shade unless the relative light intensity was reduced to $\frac{1}{300}$, such conditions being exceptional.

Posnette (A. F.). **Virus research at the West African Cacao Research Institute, Tafo, Gold Coast.**—*Trop. Agriculture, Trin.*, 28, 7–12, pp. 133–142, 1951.

This paper discusses findings since 1947 on virus diseases of cacao in West Africa [*R.A.M.*, 31, pp. 425–427], most of which has already been noticed from other sources. The subjects treated include nomenclature and classification, symptoms, destructive effect, latent infection, vectors, wild hosts, resistance, and control. Swollen shoot disease is now sufficiently understood to be controllable, the drawbacks in practice, including the extremely difficult control of the mealybug vectors, being chiefly political and more particularly economic in nature. Complete destruction of infected cacao trees (some 40,000,000 in the Eastern Province alone) is strongly recommended as the only cure for diseased farms.

Evans (H.). **Investigations on the propagation of Cacao.**—*Trop. Agriculture, Trin.*, 28, 7–12, pp. 147–203, 8 pl., 1 fig., 1 diag., 1 graph, 1951.

This is a detailed account of the investigations carried out over a number of years at the Imperial College of Tropical Agriculture, Trinidad, and associated field stations in connexion with cacao propagation by rooting stem and, more particularly, leaf cuttings, the methods being fully described. Cacao mineral deficiencies [*R.A.M.*, 30, p. 459] and their effect on the rooting of cuttings, i.e., a more rapid deterioration of mineral deficient leaves in the propagation beds, are also discussed. Nitrogen and iron deficiencies are the most frequent and are best corrected by 1 to 2 per cent. urea and 1 per cent. iron sulphate sprays, respectively. Satisfactory response to manganese and copper deficiencies, which are rare, is obtained with 0·5 per cent. manganese sulphate and Bordeaux mixture sprays, respectively. In nurseries seasonal nitrogen deficiency may still occur even where periodic fertilizer dressings are given; trees were considerably improved by small applications of artificial fertilizers every two months. Marked improvement in the condition of the cuttings during rooting was observed after the correction of mineral deficiencies and the maintenance of correct shade in the nursery.

Winter (A. G.). **Untersuchungen über die Förderung der Jugendentwicklung der Hauptgetreidearten durch bodenbewohnende Pilze.** [Studies on the promotion of early development in the principal species of cereals by soil-inhabiting fungi.]—*Phytopath. Z.*, 18, 2, pp. 221–230, 2 figs., 1951.

At the Phytopathological Institute, University of Bonn, Germany, the early development of wheat, rye, barley, and oats was stimulated to a remarkable degree

by inoculation of the seed with material from 2 per cent. malt agar cultures of a species of *Chaetomium* (strain K 5) and a *Penicillium* (K 6), isolated from compost, and strains L5 (apparently identical with K5), L6 (*Fusarium* sp.), and L8 (*Verticillium glaucum*) from garden soil [*R.A.M.*, 31, p. 296]. By the end of four weeks growth increases over the untreated controls ranging from 100 to 200 per cent. were not infrequent, accompanied by a comparable enhancement of tillering. It is presumably the development of these organisms in the spermatosphere and rhizosphere that lends an impetus to host growth which increases steadily from the time of germination.

It was demonstrated that the roots of wheat, barley, oats, and cabbage secrete substances which promote the growth of *Aspergillus niger* and *P.* sp. (K6) in tap water—the latter, in fact, being unable to develop in their absence. On the other hand, a species of *Cladosporium* (L1) and *V. glaucum* (L8) were largely and entirely independent, respectively, of the nutrient factor supplied by the root secretions. In general, the action of the secretions from the four different hosts was non-specific.

Bruehl (G. W.). **Temporary sterilization of soil in the evaluation of root and crown rot losses with Wheat and Barley under field conditions.**—*Plant Dis. Reptr*, 36, 6, pp. 234–237, 1952. [Multilithed.]

In soil sterilization field experiments from 1948 to 1951 at the Experiment Station Farm, Brookings, South Dakota, a 100 by 13 ft. strip of land was treated each spring as soon as the soil was warm with chloropicrin (3 ml. per sq. ft.) and sown with common wheat, durum wheat, and barley. Both wheat and barley responded by an initial retardation, followed by a period of accelerated growth, then a comparative deterioration in the head filling stages due to a multiplication of soil-borne pathogens, resulting in severe crown rot especially in warm seasons. The etiology of the deterioration is at present speculative, but in treated soil *Fusarium* spp. [*R.A.M.*, 30, p. 265; 31, p. 597] increased from a very low level to abundance in a few months and together with *Trichoderma* spp. [ibid., 27, p. 511] constituted a larger portion of the isolates from treated than from check soil. *Helminthosporium sativum* [ibid., 31, p. 545] was more abundant in crowns from untreated soil. The severity of late stage deterioration was greatest in durum wheat, 12 and 42 per cent. grain losses occurring, respectively, in 1948 and 1949. Common wheat suffered slightly, while barley yields were reduced by 15 per cent. in 1949.

Andrén (F.). **Resultat av 1950–51 års betningsförsök i stråsäd.** [Results for 1950–51 in cereal seed disinfection experiments.]—*Växtskyddsnotiser, Stockh., 1952*, 1, pp. 9–11, 1952.

One of the yield tests on winter wheat in the present series of seed disinfection experiments, conducted as usual at four branches of the Swedish Plant Protection Institute [*R.A.M.*, 31, p. 108], had to be given up on account of winter injury by *Typhula* [spp.: see above, p. 11]. The wheat yield of 5,220 kg. per ha., as against 4,455 for the untreated lots, resulted from seed treatment with betoxin F at 200 ml. per 100 kg., followed by 5,200 for betoxin 61 (200 gm.), 5,160 for panogen (100 ml.), 5,125 for lunasan (100 gm.), and 5,100 for a mercury-free product, höchst 2585 (200 gm.). Bunt [*Tilletia caries*] was most effectively controlled by aagrano (200 gm.), with a fall in the number of diseased plants per 10 sq. m. from 279·1 to 0·5, the corresponding figures for serfolex and lunasan (both at 200 gm.) being 0·7 and 0·9, respectively. Most of the treatments, however, reduced the incidence of infection to about one or two plants per 10 sq. m.

Lunasan (2 gm. per kg.) produced the highest barley yield of 3,250 kg. per ha., compared with 2,915 for the untreated, followed by betoxin 61 (1 gm.) and betoxin F (2 ml.) with 3,240 and 3,205, respectively. None of the treatments permitted the

development of more than a trace of stripe disease [*Helminthosporium gramineum*], while abavit tb (2 gm.) and panogen (1 ml.) eliminated it completely.

The yield of oats was raised from 2,895 to 3,065 kg. per ha. by seed treatment with betoxin 61 (1·5 gm.), the corresponding figures for the same at 3 gm., abavit tb (3 gm.), and panogen (1·5 ml.) being 3,055, 3,050 and 3,040, respectively. Aagrano, abavit tb, betoxin 61, hormotan, and lunasan (all at 3 gm.) and betoxin F (3 ml.) reduced the incidence of loose smut [*Ustilago avenae*] from 211·9 infected plants per 10 sq. m. to less than one.

Tingey (D. C.). **The bunt problem in relation to winter Wheat breeding.**—Ninth Annual Faculty Research Lecture, Utah State Agricultural College, 31 pp., 1 fig., 1 graph, 1950. [Received 1952.]

Some of the more important problems arising from the serious situation in Utah and Idaho from 1925 to 1942 due to bunt (*Tilletia caries* and *T. foetida*) attacks during the breeding of winter wheat for resistance to various races of the fungi are reviewed in this lecture delivered at the Utah State Agricultural College, Logan, in 1950. In experiments at North Logan 12 per cent. dwarf bunt [*Tilletia brevifaciens*: *R.A.M.*, 31, p. 378] reduced the acre yield by 26 per cent. and at Paradise, Utah, 23 per cent. dwarf bunt on Utah Kanred wheat reduced the yield by 35 per cent., while 33 per cent. common bunt infection reduced it by an average of 35 per cent. Yield reduction was relatively greater in resistant varieties (1 to 5 per cent. bunt infection) than in the susceptible ones. Since 1947 the infection percentage has been considerably less (never above 10) and in the 1948 survey 84 per cent., and in 1949, 94 per cent. of the fields visited had no bunt or only a trace, average infection for the remaining fields ranging from 1 to 5 per cent., with the exception of 30 per cent. in one field in 1948 and 20 per cent. in 1949. The former exception was due to badly mixed wheat and the latter to the growing of a susceptible variety, Turkey. Dwarf bunt is, however, still about twice as prevalent as common bunt. The total damage to the wheat crop in northern Utah and southern Idaho in one year, when bunt is serious, is estimated at $2,000,000 and the loss in Utah alone (about a fifth of this amount) for one serious bunt year is three to four times the total amount spent on breeding for bunt resistance in winter wheat.

Dwarf bunt differs from other bunt races in several respects [loc. cit.]. Seed inoculation, for instance, has proved unsatisfactory while the soil inoculation method was reasonably successful. Dwarf bunt does not cause smut in spring-sown grain or only little infection if the grain is sown late so that the wheat emerges during the winter.

Since the resumption in 1947 of collecting and testing bunt races no new ones have appeared, but breeding must be continued as the most resistant variety, Wasatch, is susceptible to at least two races, though these have not yet been detected in the area.

Sharp (E. L.) & Smith (F. G.). **Preservation of Puccinia uredospores by lyophilization.**—*Phytopathology*, 42, 5, pp. 263–264, 1 graph, 1952.

Two main methods of lyophilization [*R.A.M.*, 31, p. 568] were used in the authors' studies at the Department of Botany and Plant Pathology, Iowa State College, Ames, on the application of this process to the preservation of *Puccinia coronata* uredospores, two collections of *P. graminis avenae* being also included. In lyophil method F, adapted from Raper and Alexander (*Mycologia*, 37, pp. 499–525, 1945), the spores were frozen at −45° to −50° C. before drying under vacua ranging from 20 to 150 μ at −10° for two to three hours and at room temperature for a further period of about an hour. In lyophil method NF the initial freeze was omitted and the tubes were maintained at room temperature for a three-hour drying period.

With method F the duration and temperature of the drying periods affected the percentage of spore survival tested by germination on 3 per cent. gelatin (method A). It ranged from 50 to 75 per cent. during processing and then remained fairly constant for some weeks before declining slowly to less than 1 per cent. However, the apparently non-germinable spores were found to be still infective and the germination percentage was raised to the initial post-lyophil level by placing them in a saturated moist chamber for 24 hours at room temperature before dusting on gelatin (method B). The application of lyophil method NF resulted in a survival during processing of 85 to 90 per cent. For non-lyophilized spores there was no difference in the germination percentages between methods A and B.

Under favourable conditions high percentages of *P. coronata* (52 to 95) and *P. graminis* (40 to 74) uredospores have survived for periods of up to 500 and 300 days, respectively. On the other hand, the viability of non-lyophilized spores of the same collections stored in stoppered tubes at 5° to 10° and 25 to 50 per cent. relative humidity fell markedly (mostly to less than 1 per cent.) after a year.

Pathogenicity tests with lyophilized and non-lyophilized samples of *P. coronata* and *P. graminis* uredospores revealed a satisfactory correspondence between infection ratings on Markton oats [*R.A.M.*, 19, p. 588] and germination percentage by method B. In another test on selected members of differential oat varieties [ibid., 16, p. 245] with physiologic race 88 and a mixture of races 45 and 57 of *P. coronata*, the lyophilized and fresh spores produced the same reactions, indicating the absence of any physiological change during processing or storage.

Tubes containing lyophilized spores have been held at room temperature *in vacuo* for several months without loss of viability, which did occur, however, when fissures developed in the tubes during storage.

Kenbar winter Barley. —*Seed World*, 71, 5, pp. 8, 47, 1 fig., 1952.

Kenbar, a new winter barley, is resistant to loose smut (*Ustilago nuda*) [*R.A.M.*, 30, p. 482; 31, p. 485], and highly resistant to mildew [*Erysiphe graminis*: ibid., 31, pp. 60, 248] and leaf blotch [*Rhynchosporium secalis*: ibid., 31, p. 549], but moderately susceptible to leaf rust [*Puccinia hordei*: ibid., 26, p. 99], though damage from the last is minimized by the early maturity of the variety. It was developed from a selection from Composite Cross X (C.I. 6625), and released in Kentucky and Pennsylvania in the autumn of 1951. According to the Pennsylvania Crops Improvement Association data, the yield of Kenbar in 1951 amounted to 53·3 bush. per acre compared with the average of 35·5 bush. for Pennsylvania.

In artificial inoculation experiments over five years at Lexington, Kentucky, with local smut collections Kenbar averaged 2·1 per cent. heads destroyed compared with 18·5 for Mo. Early Beardless [ibid., 29, p. 359], 35·5 for Ky I, and 69·6 for Jackson 1.

New Oat variety popular.—*Seed World*, 71, 4, p. 37, 1952.

It is reported from the University of Illinois that Missouri O–205, a new oat variety resistant to crown and stem rusts [*Puccinia coronata* and *P. graminis*: *R.A.M.*, 31, pp. 113, 180, 549], will be released generally by 1954. Moderate supplies, however, should be available for farmers in 1953.

Hingorani (M. K.). **The effect of temperature and light on the mesothetic reaction of Jostrain Oats to stem rust.**—*Indian Phytopath.*, 4, 1, pp. 85–87, 1951.

This paper is condensed from a thesis resulting from studies at the University of Minnesota, of the effect of temperature and light on the reaction of the differential oat variety Jostrain [*R.A.M.*, 13, p. 363; 31, p. 486] to physiologic races 2, 5, 8, and 10 of *Puccinia graminis avenae* [loc. cit. and ibid., 31, p. 179]. Plants were

inoculated in the seedling stage with single-sorus cultures of each race and kept in a moist chamber for 48 hours before being tested.

The principal effect of temperature was on infection type X produced by races 5 and 10. At 30° C. sporulation was so abundant that grades 3 to 4 were recorded; at 18° sporulation was reduced and the infection type was X—; a typical mesothetic reaction was produced at 24°. With race 2 the only change occurred at 18° when sporulation was reduced considerably and the infection type classified as X—. Race 8 showed no change at any temperature. At high light intensity (5,000 to 9,000 foot-candles) races 5 and 10 induced 3 to 3+ reactions and at low intensity (100 to 400) type X—. At the intermediate intensity (500 to 1,500), however, the normal mesothetic reaction was produced.

Singh (R. S.), Mehta (P. R.), & Singh (B.). **Red spot diseases of leaves of Jowar (Andropogon sorghum Brot.). I. Ascochyta leaf spots.**—*Indian Phytopath.*, 4, 1, pp. 45–57, 2 pl., 1951.

The first paper in this series on fungi causing 'red spots' on sorghum leaves, from the Plant Pathological Laboratory, Government Agricultural College, Kanpur, concerns certain etiological and pathological aspects of *Ascochyta sorghi* [*R.A.M.*, 31, p. 331], a new record for India, found on sorghum, Sudan grass, and Johnson grass (*Andropogon halepensis*) [*Sorghum halepense*] at Kanpur. Its appearance, severity, and rapid spread appear to be favoured by a temperature range of 20° to 35° C. and excessive humidity. The spots vary from light to dark brown while the streaks are either large and elongated or form broad patches.

The light brown to black pycnidia are either embedded in the leaf tissue or are superficial. In culture the fungus produces black, stromatic bodies like pycnidia, but no spores. The mycelium and stromata infected sorghum leaves. One-year-old pycnidia from host leaves were unable to cause infection when applied by spraying but did so when mixed with sterilized soil in pots.

The minimum, optimum, and maximum temperatures for spore germination were 25°, 30° to 32°, and 38°, respectively. The mycelium, pycnidia, and spores withstood freezing for short periods. In culture the mycelium dies within 24 hours at temperatures above 42°; the pycnidia survive 48° for at least 36 hours, but are killed within eight hours at 50°. The spores are killed within ten minutes at 48°; in nature their viability is lost within six months.

The disease is perpetuated through the mycelium and pycnidia in the soil and in diseased leaf trash left in the field, and spread takes place by pycnidia and spores being carried by wind, water, and insects. The presence of perennial grass hosts such as *S. halepense* also plays an important part in its dissemination.

Stewart (I.) & Leonard (C. D.). **Molybdenum deficiency in Florida Citrus.**—*Nature, Lond.*, 170, 4330, pp. 714-715, 1 fig., 1952.

Investigations at the Citrus Experiment Station revealed that molybdenum deficiency occurs in citrus trees [*R.A.M.*, 28, p. 571] throughout the citrus-growing area of Florida. Although practically all kinds are affected the disorder is particularly severe on trees on grapefruit rootstocks. It appears first as watersoaked areas on the leaves in early spring, later developing into large interveinal yellow spots with gum on the lower leaf surface. Badly affected leaves drop and in extreme cases there may be almost complete defoliation during the winter.

The yellow spots reverted to green within three to four weeks of receiving molybdenum foliage sprays, some response being obtained with only 0·1 gm. sodium molybdate. The lowest amount giving a satisfactory response was 0·1 oz. per tree in 10 gals. water. Injection by pressure of 1 gal. of a solution containing 1 gm. sodium molybdate into the trunk, using an apparatus similar to that described by Southwick [ibid., 25, p. 111], returned the leaves to normal within ten days.

The molybdenum content of yellow-spot grapefruit and orange leaves varied from 0·03 to 0·08 p.p.m. Two trees receiving soil applications of 1 gm. and 1 oz. sodium molybdate, respectively, had foliar concentrations of 0·05 and 0·08 p.p.m. three months later; there was no visible greening of the leaves six months after application. Molybdenum sprayed on trees did not appear to be readily translocated. The total molybdenum content of Florida citrus soils ranges from 0·2 to 0·4 p.p.m., the amount of soluble molybdenum being less than 0·001 p.p.m. Grapefruit trees in plots at the Citrus Experiment Station in soil of pH 4·2 were severely affected, the leaves containing 0·03 p.p.m. molybdenum. Trees were green, however, on adjacent plots limed to pH 5·6, the leaf content being 0·06 p.p.m.

Aldrich (D. G.) & Coony (J. J.). **A field response of Citrus to phosphorus and potassium fertilization.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 13–21, 5 figs., 1 graph, 1952.

Fertilizer applications (spring or autumn) to lemon trees showing leaf spot symptoms known to be due to low potassium and low phosphorus contents [*R.A.M.*, 29, p. 98] were broadcast round the dripline of the trees in April and November, 1949, in six different places in California [ibid., 31, p. 62]. Within four months leaf fall was retarded, much new growth started, and the leaves had become larger, more vigorous, and greener. The phosphate content of the leaves was increased from a deficient level to a sufficient one [ibid., 29, p. 24] and remained well above the deficiency range (0·07 to 0·1 per cent.) throughout the season. The average increase in yield per tree due to the phosphate application varied from 9 to 60 per cent. Orange trees given phosphate fertilizer also displayed marked vegetative improvement.

Childs (J. F. L.). **Cachexia disease, its bud transmission and relation to xyloporosis and to tristeza.**—*Phytopathology*, 42, 5, pp. 265–268, 1 fig., 1952.

The author presents the results of an experiment in the bud transmission of cachexia, a disease of Orlando tangelo (*Citrus paradisi*×*C. reticulata*) in Florida [*R.A.M.*, 30, p. 226]. Transmission was effected repeatedly under controlled conditions by means of buds taken from typically diseased trees. Seedling tangelo trees were infected by means of diseased budwood, whereas adjacent unbudded seedlings and those budded with sound material remained healthy.

The gum impregnation and discoloration of the phloem characteristic of cachexia were shown by rootstock experiments in Florida and Texas to occur also in the mandarin, kumquat (*Fortunella margarita*), calamondin (*C. reticulata*×*Fortunella*), limequat (*C. aurantiifolia*×*F. japonica*), and tangor (*C. reticulata*×*C. sinensis*). The disease was further shown to be present in grapefruit and sweet orange with no phloem symptoms. Symptomless carriers may be detected by budding to seedlings of varieties like the Orlando tangelo, in which symptoms readily develop.

From a comparative study of the described symptoms and an examination of wood specimens it is concluded that cachexia and xyloporosis [ibid., 31, p. 282] are identical. On the other hand, a comparison of the host relationships of these two and tristeza [ibid., 31, p. 431 and next abstract] strengthens the already existing evidence that the latter is distinct.

Costa (A. S.), Grant (T. J.), & Moreira (S.). **Budtake of healthy and tristeza-infected Citrus buds.**—*Phytopathology*, 42, 5, pp. 280–281, 1952.

At the Agronomic Institute, Campinas, Brazil, tests were carried out on the comparative growth on different citrus rootstocks of shoots from healthy buds and those infected by tristeza root rot [*R.A.M.*, 31, p. 62 and preceding abstract]. Viruliferous buds of four sweet orange varieties were obtained from plants on sour

orange rootstocks showing symptoms of decline in the greenhouse. Comparable healthy plants of the same combinations served as the virus-free source. Buds of Eureka lemon, Columbia sweet lemon, and Dancy tangerine were procured from healthy and diseased plants budded on sour orange stocks in the field, while healthy and viruliferous buds of West Indian lime and grapefruit were taken from unbudded greenhouse seedlings, the infected specimens of which showed definite symptoms of decline. All these buds were inserted into rootstocks of sweet and sour orange, two limes, mandarin, tangerine, and lemon. Most of the tests were performed on field plants in the nursery, but a few were made with potted plants in the greenhouse.

A better bud-take was recorded for viruliferous than for healthy buds of six sweet orange varieties, Eureka lemon, Columbia sweet lemon, Dancy tangerine, and two West Indian limes. On the other hand, the difference between healthy and infected grapefruit (six varieties) in this respect was negligible. The generally superior bud-take of the viruliferous buds, even on the non-tolerant sour orange rootstock, is interpreted as an indication that the virus exerts no adverse effect on the formation of callus tissue at the bud union.

The apparent inducement by the tristeza root rot virus, in the early phase of decline, of an accumulation of synthates in an infected scion budded on a non-tolerant rootstock [ibid., 28, p. 522] suggests that the better take secured with viruliferous buds might have resulted from the presence of a larger quantity of nutrients or hormones in the diseased than in the sound tissues. Such an effect would probably correspond to the horticultural practice of girdling the branches of trees before removing the budwood to ensure a better take.

Tosco (U.). **Sulla penetrazione di Penicillium digitatum Sacc. e Penicillium italicum Wehmer nei frutti degli Agrumi.** [On the penetration of *Penicillium digitatum* Sacc. and *Penicillium italicum* Wehmer into Citrus fruits.]—*Nuovo G. bot. ital.*, 58, 3–4, pp. 441–449, 3 figs., 1951. [English summary. Received October, 1952.]

Experimental inoculations of five varieties of wounded and unwounded oranges, also mandarin and sour orange with *Penicillium digitatum* and *P. italicum* [cf. *R.A.M.*, 31, p. 603] showed that spore germination required the presence of a high degree of moisture, no mycelium forming on unwounded fruits inoculated superficially with dry spores and kept at 70 to 77 per cent. humidity; also no infection occurred when the oranges were peeled (though without producing deep lesions) before inoculation. When the fruits were kept in a damp chamber, however, the spores germinated and mycelial spread was accelerated.

When the spores were placed in an oil gland no mycelium developed, though in stored fruits emission of oil as a result of bruising or superficial wounds facilitates the spread of the fungi and their penetration into the fruits. Similar phenomena were observed with experimentally bruised fruits, in others kept for long periods in a damp chamber, and particularly in those allowed to come into contact with water. Fungal development was most frequent at the stalk and stylar ends. The juice was an optimum substrate. The deeper the inoculation site the more rapidly did infection develop. Fungal development was particularly frequent in fruits in which bruising had caused conspicuous laceration of the epicarp and mesocarp. It is concluded that both fungi can act as wound and contact parasites.

Bemelmans (J.). **A potassa na adubação do Cafeeiro.** [Potassium as a fertilizer for the Coffee plant.]—*Bol. Suptda Serv. Café, S. Paulo*, 27, 301, pp. 215–216, 2 col. pl., 1952.

Potassium is considered to be the most important of all th e elements in the nutrition of coffee; in São Paulo, Brazil, applications to the soil round the base of

each plant are recommended at a dosage of 30 to 90 gm., the corresponding quantities for phosphoric acid and nitrogen being 20 to 80 and 5 to 20 gm., respectively. The symptoms of potassium deficiency [*R.A.M.*, 30, p. 156] are depicted in colour.

Pearson (E. O.). **Field key to the principal disorders of Cotton in Africa.**—*Emp. Cott. Gr. Rev.*, 27, 1, pp. 10–15, 1950.

This useful key for the determination of the principal cotton pests and diseases is based on that of A. Brixhe [*R.A.M.*, 18, p. 248], but is designed for use anywhere in Africa and forms a part of a projected handbook of African cotton disorders. Symptoms are tabulated under different parts of the plant.

Misra (A. P.). **Factors affecting variability in the development of Melampsora lini.**—*Phytopathology*, 42, 4, pp. 204–210, 1 graph, 1952.

Laboratory and field studies at the Minnesota Agricultural Experiment Station on the factors governing the epidemiology of flax rust (*Melampsora lini*) [*R.A.M.*, 5, p. 555; 6, p. 358] were carried out principally with race 4, supplemented in some of the tests with 16 and 17 A [ibid., 31, p. 552]. The method of inoculation and incubation was based on that used by Stakman *et al.* for the determination of physiologic races of *Puccinia graminis* [ibid., 2, p. 158; 24, p. 272].

The uredospores germinated at a temperature range of 33° to 77° F. The germ-tubes 24 hours after germination on water agar were longer at 59° than at 42° or 73°, those of race 17 A attaining a greater length after four and eight hours than those of 4. They lost their viability in a few hours at 100° to 104°. Partial shading in the field failed to maintain viability at 98° to 100° but did so at 88° to 90°. Uredospores matured earlier on plants at 85° than at 75° or 65°, but lost their viability correspondingly sooner. At 65° the incubation period was eight days and at 75° and 85° six. At 37° it was 44 days, but this period could be reduced to 22 by maintaining the inoculated plants at 75° for four days before transference to the lower temperature. Inoculated plants held at 37° for varying periods developed uredosori one to three days after exposure to a temperature of 68°.

The Buda and Minerva varieties were moderately resistant to races 17 A and 4, respectively, at 65° but fairly susceptible at 85°. Rusted leaves began to shrivel six or seven days earlier at the latter than at the former temperature. Inoculated plants kept for four days at 75° before exposure to 95° to 99° for 30 hours developed only traces of rust.

Teleutosori were produced earliest at 75° and large numbers were formed at 65° and 75°, but not at 85°, while teleutospores germinated and caused infections freely at the two lower temperatures but not at the higher one. The germinability of field-produced teleutospores was equally good in August and October. Most of those collected in the field and stored in the laboratory at 80° for seven months lost their viability before the following spring.

The incidence of field infection fell heavily when a temperature of or exceeding 92° prevailed for two or three days in conjunction with low relative humidity. Partial shading of field plants delayed their maturity, thereby enabling the rust to continue longer than on unshaded ones.

Ghosh (T.), Basak (M.), & Kundu (B. C.). **Effect of insolation and chemical treatment in relation to storing of Jute seeds.**—*Indian Phytopath.*, 4, 1, pp. 38–44, 1951.

Further work in this series on the control of stem rot (*Macrophomina phaseoli*) [cf. *R.A.M.*, 27, p. 71] in seed of *Corchorus capsularis* and *C. olitorius* prior to storage was undertaken at the Jute Agricultural Research Institute, Hooghly, West Bengal.

The seeds were best stored after drying in the sun for at least four days when the average moisture content was 7·5 per cent. Samples stored without drying lost their viability after 14 months. After drying the seed should be treated with agrosan G or new improved granosan (ethyl mercuric chloride containing 2 per cent. mercury) and kept under dry conditions in air-tight, moisture-free, non-porous containers. Tests were carried out to compare the relative efficiency of sun-drying for various periods alone and followed by seed treatment. In October, 1945, sun-drying was for three days, the germination and disease percentages for each treatment being 74·8 and 19, 78·5 and 1·3, and 81·4 and 3·2, respectively. The corresponding figures for tests in 1946 with seven days' drying were 76·5 and 10·6, 82·7 and 2·2, and 83·2 and 2·6 in February and 83·1 and 9·7, 81·3 and 0·28, and 80·9 and 0·22, respectively, in March. N.I. granosan tended to retard germination.

Jenkins (Anna E.) & Miller (J. H.). **A new species of Sphaceloma on Magnolia.**—*J. Wash. Acad. Sci.*, 42, 10, pp. 323–325, 1 fig., 1952.

A description is given of *Sphaceloma magnoliae* n.sp., agent of a leaf scab of *Magnolia grandiflora* previously recorded in Florida, Georgia, Louisiana, and Mississippi (*Phytopathology*, 33, p. 6, 1943). It was particularly abundant and severe in Georgia from 1941 to 1943 but has since been less harmful. The spots, confined to the upper leaf surface, are few to very numerous, often concentrated along the midrib, margin, or apex, grey with a brown margin, and coalescent, measuring 1·5 mm. in diameter. The numerous black, epiphyllous, intra-epidermal, erumpent acervuli are 20 to 40 μ in diameter and 12 to 24 μ thick. The awl-shaped, continuous or uniseptate conidiophores are 12 to 16 μ thick; conidia were not seen.

Hair (J. B.). **Blind-seed of Ryegrass. III. Effect of fungicides on the disease.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 1, pp. 117–121, 1952.

Preliminary investigations on the control of blind seed disease (*Phialea temulenta*) [*R.A.M.*, 28, p. 403] of perennial rye grass [*Lolium perenne*] by the use of fungicides at flowering time were carried out at the Department of Scientific and Industrial Research, Auckland, New Zealand. At the mid-flowering stage (one or more florets open in most spikelets) potted plants, trimmed to six to twelve heads each, were either (*a*) treated with a fungicidal dust or spray at midday and inoculated later in the afternoon with a macroconidial suspension prepared from potato-dextrose agar cultures of *P. temulenta* and applied by a hand atomizer; (*b*) inoculated only; or (*c*) sprayed with sterile water, and all transferred immediately to humidity chambers in the open. After 24 hours plants in groups (*a*) and (*b*) were reinoculated and (*c*) sprayed again with sterile water; all were then incubated for a further 24 hours. Under these conditions flowering continued normally. At the end of the incubation period the pots were sunk in the ground in a semi-shaded situation, the uninoculated ones being isolated from the others. The results obtained showed that artificial inoculation with *P. temulenta* was possible, though the degree of infection was inconsistent. A method based on germination counts was the most satisfactory way of assessing infection. Phygon spray (1 lb. per 100 gals.) gave a highly significant reduction in infection (89 per cent. germination compared with 53 per cent. for the untreated, inoculated plants). Bordeaux spray (10–8–100), copper carbonate dust, and dithane D14 (4 lb. per 100 gals. water) also gave measurable control (66, 95, and 78 per cent. germination, respectively, with 37, 78, and 58 in the untreated).

Fischer (G. W.) & Meiners (J. P.). **Ustilago turcomanica Tranzsch. in the United States.**—*Mycologia*, 44, 2, pp. 207–212, 1 fig., 1952.

In 1938 and again in 1939 *Agropyron orientale* var. *lasianthum* plants introduced

from Turkestan and growing in the nurseries of the Soil Conservation Service, Pullman, Washington, developed a head smut at first attributed to *Ustilago bullata* [cf. *R.A.M.*, 20, p. 121; 30, p. 472], but now recognized as due to *U. turcomanica* [cf. ibid., 6, p. 123], which differs from the foregoing in features of spore germination. The promycelium or its branches bear sporidium-like bodies which are detached only with difficulty. The disease was probably introduced with the seed. Inoculation experiments demonstrated that species of *Elymus* and *Agropyron* are hosts and that infection occurs in the seedling stage. The characteristics of spore germination, behaviour in culture, and sexuality of *U. turcomanica* are described.

Halpin (J. E.), Hanson (E. W.), & Dickson (J. G.). **Studies on the pathogenicity of seven species of Pythium on Red Clover seedlings.**—*Phytopathology*, 45, 5, pp. 245–249, 2 figs., 2 graphs, 1952.

This is an expanded account of studies at the Wisconsin Agricultural Experiment Station on the pathogenicity of seven species of *Pythium* to red clover seedlings, the essential information on which has already been presented in a summarized form [*R.A.M.*, 31, p. 386].

Björling (K.). **Über die Entwicklungsgeschichte, Variabilität und Pathogenität von Sclerotinia trifoliorum Erikss.** [On the life-history, variability, and pathogenicity of *Sclerotinia trifoliorum* Erikss.]—*Phytopath. Z.*, 18, 2, pp. 129–156, 86 figs., 3 diags., 3 graphs, 1951.

This is a recapitulation of the author's exhaustive studies on the clover rot fungus (*Sclerotinia trifoliorum*), published in a Swedish journal with a limited circulation in 1939 and 1942, a notice of which has already appeared [*R.A.M.*, 22, p. 98]. The present version, intended for a wider public, also comprises references to later work on the same subject by various authors, e.g., Frandsen in Denmark [ibid., 27, p. 365].

Black (L. M.) & Brakke (M. K.). **Multiplication of wound-tumour virus in an insect vector.**—*Phytopathology*, 42, 5, pp. 269–273, 2 figs., 1952.

During seven serial passages of the wound-tumour [clover big vein] virus through *Agallia constricta* [*R.A.M.*, 30, p. 324], the virus in the insect vectors was not replenished from the immune Grimm lucerne plants on which they were maintained. The dilution of the initial quantity of virus thus exceeded 10^{-18}, yet there was as much present at the close as at the beginning. The amount of virus was approximately equal at each of the six preceding passages, and it is concluded that, as in the case of aster yellows virus [ibid., 31, p. 221], the clover big-vein virus must have multiplied in its leafhopper vector.

The logarithm of the percentage of leafhoppers rendered infective to crimson clover plants by different virus suspensions was in direct proportion to that of the virus concentration.

Seed treatment of southern forage crops.—*Seed World*, 71, 4, p. 40, 1952.

In seed disinfection tests [*R.A.M.*, 30, p. 613] carried out in Oklahoma, Texas, Alabama, Georgia, Tennessee, and North Carolina in co-operation with the representatives of the Du Pont Company, nine types of forage crops were treated with arasan, the cost of which was only about 1 cent per lb. of seed more than the price of unprotected seed of the same quality. Striking results were obtained for all crops, average stand increases ranging from 17 to 130 (Sericea *Lespedeza*) and 227 per cent. (Ladino clover). In one experiment with Sericea *Lespedeza* 164 per cent. more plants developed as a result of seed treatment.

Sarojini (T. S.). **Soil conditions and root diseases. Part II. Fusarium udum disease of Red Gram (Cajanus cajan (Linn.) Millsp.).**—*Proc. Indian Acad. Sci.*, Sect. B, 33, 2, pp. 49–68, 2 graphs, 1951. [Received October, 1952.]

In further studies at the University Botany Laboratory, Madras, on soil conditions in relation to root diseases (*J. Madras Univ.*, Sect. B, 19, pp. 1–32, 1950) several distinctly varying *Fusarium* strains were employed. Strain I (*F. udum*) [*R.A.M.*, 31, p. 609] was obtained from the Agricultural Research Institute, Coimbatore; II, III, and IV were isolated from roots of field-infected pigeon pea plants at Coimbatore; V from pigeon pea seeds and VI from both stubble and seeds which became infected when buried in Coimbatore wilt-sick soil; and VII and VIII from the laboratory garden plot. Comparative cultural studies revealed that the Coimbatore strains were most closely allied to strain I. In pathogenicity tests with pigeon pea, strains I, II, and III were more virulent than the others; V and VI were mainly responsible for pre-emergence damping-off.

The addition to infested soil of solutions of boron and zinc at 20 p.p.m. and manganese at 40 p.p.m. (the optimum levels) increased seedling emergence and resulted in greater plant vigour, earlier flowering, and the production of seeds with a higher germinative capacity. Manganese was the most, and boron the least, beneficial. The micro-nutrients were more effective on emergence and subsequent plant development in wilt-infested soil when used separately than in combination. With separate and combined nutrients at the same rates, a combination of boron, manganese, and zinc, each at 40 p.p.m., produced the tallest plants and induced the earliest flowering. Pre-soaking seeds in 2, 5, and 20 p.p.m. solutions of each element for 16 and 24 hours resulted in earlier germination and more vigorous seedlings. Longer periods in all levels of boron were detrimental to germination while the reverse was true for manganese. Eight and 16 hours' pre-soaking were more favourable for zinc than 24 hours.

The colonization of *Fusarium* on host stubble buried in infested soil was temporarily retarded by the addition to the soil of micro-nutrients, particularly zinc; after four months there was no colonization with 20, 40, and 80 p.p.m. zinc compared with 100 per cent. in the control. The survival of *F. udum* on infected stubble in the soil was reduced by the addition of micro-nutrients, the fungus being exterminated within four to six weeks by zinc.

Turnbull (J.). **The control of Apple scab in difficult conditions.**—*Fruit Gr., 1952*, 2968, pp. 891–892, 1952.

The results of the 1952 Cranbrook Fruit Spraying Competition against apple scab [*Venturia inaequalis*: cf. *R.A.M.*, 31, p. 610] indicate that in spite of wet weather in April and May favourable to the development of scab no case of severe infection was found in the competition areas though outside it they were easily detected; frequent sprays (no interval greater than 14 days, usually less) with smaller quantities were more economical and better suited for difficult conditions; and mechanical spraying proved to be as effective as the most efficient hand spraying, which gave the best results only when applications were heavy. In all cases but one 3 per cent. lime-sulphur was used before, sometimes during, and after blossoming, followed by 2 per cent. once or twice, 1½ or 1 per cent. in the pink bud, and 1 per cent. during blossoming and later, at 14- or seven to 10-day intervals, the latter being the most satisfactory. Higher concentrations resulted in spray injury without improving control. Thus, six applications of lime-sulphur (300 to 600 gals. per acre per spray and a total of 2,700 gals.) applied with a hand sprayer completely eliminated scab. In one orchard where two hand applications of Bordeaux-oil were given in April and two in June after a 38- to 46-day interval there was only a little more than a trace of scab, but damage was observed on the leaves.

Many competitors used sulphur, mercury, or mixtures for later applications, but none was better than any other.

Black (J. D. F.). **Black spot control on Apples and Pears.**—*J. Dep. Agric. Vict.*, 50, 8, pp. 352–354, 6 figs., 1952.

The spray schedule originally recommended for the control of apple scab (*Venturia inaequalis*) in Victoria [*R.A.M.*, 31, p. 20] is modified as follows. Bordeaux 15–15–100 [cf. ibid., 31, p. 496] is applied at the green tip stage (slightly earlier for Jonathan) and at finger tip to varieties not susceptible to russet, e.g. Delicious, Granny Smith, and Rome Beauty. Russet-susceptible varieties such as Jonathan, London Pippin, Yates, Rokewood, and Gravenstein receive lime-sulphur 3–100 at pink bud. All varieties are sprayed with 2–100 lime-sulphur at petal fall and with $1\frac{1}{4}$–100 at 14-day intervals until the onset of warm, dry weather and then as required.

For pear scab (*V. pirina*) [ibid., 31, p. 20] Bordeaux 15–15–100 is applied to the Josephine and Winter Cole varieties at early green tip and to all except these at delayed green tip and finger tip (the latter application to be completed before the petals show white). Not less than three weeks after petal fall Bordeaux 6–6–100 is applied to William's [Bon Chrétien], Beurré Bosc, Winter Nelis, and Madame Cole and 2–2–100 to Packham's [Triumph] and other clear-skinned varieties, except Josephine and Winter Cole which may be sprayed with 0·125 per cent. thiram. Where summer control is necessary, Bordeaux 2–2–100 should be applied to William's Bon Chrétien, Beurré Bosc, and Packham's Triumph and 0·125 per cent. thiram to Josephine.

Moon (H. H.), Harley (C. P.), & Regeimbal (L. O.). **Early-season symptoms of magnesium deficiency in Apple.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 61–64, 1 fig., 1952.

On 24th May, 1951, 28 days after full bloom, the primary leaves of fruit-bearing spurs of Delicious apple trees growing at the Plant Industry Station, Beltsville, Maryland, bore an unusual symptom ascertained by leaf analysis to be due to magnesium deficiency [cf. *R.A.M.*, 23, pp. 442, 443; 29, p. 624, *et passim*]. The affected leaves were mostly puckered and distorted with dark brown marginal burning and occasional interveinal necrosis. The basal leaves of water sprouts growing on the affected trees also showed marginal scorch. Other varieties displaying early symptoms of magnesium deficiency included Stayman Winesap, Golden Delicious, Wealthy, Baldwin, and Grimes Golden. Analyses of spur leaves, fruit flesh, and seeds sampled on 25th June clearly demonstrated that the scorching of the leaves on fruiting spurs resulted from translocation of magnesium to the seeds.

Hesse (C. O.). **Apricot culture in California.**—*Circ. Calif. agric. Ext. Serv.* 412, 58 pp., 29 figs., 2 graphs, 1 map, 1952.

Most of the Californian apricot diseases and methods of control dealt with in Section V of this circular (12 pp.) have already been noticed from other sources. Ferbam sprays ($1\frac{1}{2}$ lb. to 100 gals.) at full bloom have given good control of jacket (or green) rot caused by *Sclerotinia sclerotiorum* [*R.A.M.*, 30, p. 572] or by *Botrytis cinerea* [loc. cit.]. Soil fumigation proved most promising for the control of *Armillaria* root rot (*A. mellea*) [ibid., 27, p. 372]. The trees from the infected area were removed, together with all the roots in the top 12 in. of soil when it had become dry during the summer, and into holes (6 to 8 in. deep and 18 in. apart) punched with a metal rod carbon disulphide ($1\frac{3}{5}$ liquid oz. or 2 oz. by weight) [cf. ibid., 30, p. 608] was poured. The chemical should not be inserted nearer than 6ft. to the

base of the healthy trees. No control is as yet known for black heart (*Verticillium albo-atrum*) [ibid., 10, p. 757] once it has entered the tree. Similarly no control is known for crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) [ibid., 5, p. 371], which is very widespread and may persist in the soil for five or six years, though treatment of young affected trees with elgetol-methanol [cf. ibid., 31, p. 230] may lengthen their life. Where most of the bark is affected, one part only at a time should be treated, an interval of a month or two being allowed to elapse before the next part is treated. Healthy parts of the tree cut with contaminated tools should be treated with diluted mixture (1 to 9 parts of water). Treatment is not recommended during the warmest part of the summer and the treated parts should be covered with soil to prevent sunburn. Though no control is known for bacterial canker (*Pseudomonas syringae*) [ibid., 16, p. 329], the development of new cankers can be checked to a certain extent by autumn sprays of Bordeaux mixture (6–6–50 or 8–8–50). Injury due to boron toxicity [ibid., 21, p. 26] is best controlled by the adequate use of water low in boron. Zinc sulphate spray during the dormant season, 50 lb. to 100 gals. in the first year and 25 lb. every year afterwards, gives the best control of little-leaf zinc deficiency [ibid., 22, pp. 34, 210]. Driving zinc-coated nails or pieces of zinc 1 in. apart into the sapwood or applying zinc sulphate (15 to 20 lb. per tree) in 12- to 14-in. deep trenches 4 ft. from the trunk in stubborn cases are particularly useful methods in small areas where trees do not respond to other treatments. Zinc deficiency may sometimes be cured by a zinc oxide foliage spray (5 lb. to 100 gals.) applied early in spring.

Cain (J. C.) & Boynton (D.). **Fertilization, pruning and a leaf mottle condition in relation to the behaviour of Italian Prunes in Western New York.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 53–60, 1952.

In western New York, Italian Prune frequently give unsatisfactory yields and the trouble appears to be associated with a leaf mottle [cf. *R.A.M.*, 19, p. 480] which is very prevalent and causes, in some way not yet ascertained, decreased fruit set and increased fruit drop, though exercising no marked effect, except in the most severe cases, on the growth of the trees. There was no indication that the condition is associated with the absorption and accumulation of mineral nutrients in the foliage.

Alexopoulos (C. J.) & Cation (D.). **Gnomonia fragariae in Michigan.**—*Mycologia*, 44, 2, pp. 221–223, 1952.

From further studies on the fungus associated with stem-end rot of strawberries in Michigan [*R.A.M.*, 28, p. 130] the authors conclude that it is *Gnomonia fragariae*, and, though frequently associated with *Dendrophoma obscurans* [ibid., 31, p. 442] and previously regarded as the perfect state, it is now considered distinct. The only previous records of *G. fragariae* outside North America appear to be in Germany in 1908 and in France in 1930.

Demaree (J. B.) & Smith (N. R.). **Nocardia vaccinii n.sp. causing galls on Blueberry plants.**—*Phytopathology*, 42, 5, pp. 249–252, 2 figs., 1952.

Further studies are reported on the morphological and cultural characters of the actinomycete responsible for the production of bud-proliferating galls on blueberry (*Vaccinium australe* × *V. ashei*) at the Plant Industry Station, Beltsville, Maryland, a note on which has already appeared [*R.A.M.*, 26, p. 551]. The organism has now been identified as a species of *Nocardia* closely allied to *N. minima* (Jensen) Waksman & Henrici [ibid., 11, p. 601; 28, p. 514], but the former is different in that it can utilize glycerol, mannitol, and citrates, reduce nitrates, and is pathogenic to blueberry. It is described as *N. vaccinii* n.sp.

McNew (G. L.), McCallan (S. E. A.), & Miller (P. R.). **The control of fruit and vegetable diseases.**—*Repr. Boyce Thompson Inst.* 694, 62 pp., 36 figs., 6 graphs, 2 maps, [?1951].

A revised copy of this series of 12 articles, compiled by a committee appointed by the American Phytopathological Society to ascertain the current status of diseases of fruit and vegetables in the United States and the recommendations of the various State authorities for their control, was released in *Canning Tr.*, 73, 20, 1950, to 73, 32, 1951. Chapter I includes a survey of the severity of fruit and vegetable diseases. Complete, comprehensive reports from 31 States indicated that 72 chemicals (fungicides, bactericides, and nematocides) were used in disease control, representing less than a third of the materials under current investigation in the United States.

Chapter II deals with the symptoms, economic importance, and control of the principal diseases of apple, pear, and quince. Less prevalent diseases with their distribution by States and recommended control methods are tabulated. A detailed study of records of apple scab (*Venturia inaequalis*) during the past 30 years showed that yearly losses from 1920 to 1939 ranged from 1 to 13 per cent. of the national crop, with an average of 5·6 per cent. The total crop destroyed during this period was probably 209,000,000 bush., representing an annual loss of about $10,000,000 in spite of the best control practices then in use. In most States scab is classified as a major disease warranting regular sprays on most farms. Annual losses, in spite of spray operations (except in Ohio and Missouri), range up to 20 per cent. Most States recommend the older, tried materials such as wettable sulphur and lime-sulphur [*R.A.M.*, 31, p. 436], while in warmer areas insoluble copper compounds and Bordeaux mixture are preferred, particularly in the cover sprays when bitter rot (*Glomerella cingulata*) [ibid., 30, p. 52] and black rot (*Physalospora obtusa*) [ibid., 26, p. 347; 30, p. 475] are also serious. Bitter rot is most severe south of a line from central Ohio through Pennsylvania; in this infection belt many yellow varieties are practically destroyed. Blotch (*Phyllosticta solitaria*) [ibid., 27, pp. 529, 573] is most important in the Mississippi Valley.

Chapter III deals with the chemical control of diseases of stone fruits, of which brown rot (*Sclerotinia fructicola*) is the most serious, causing an annual loss of over $5,000,000 worth of peaches in the United States. Sulphur fungicides are accepted as the standard sprays [ibid., 31, p. 612] in most States, peaches requiring about 17 per cent. of the total of 166,000,000 lb. of sulphur used annually for plant disease control. A properly applied brown rot schedule usually controls most other diseases as well.

Chapter IV covers the principal diseases of grape vines, bush and bramble fruits, strawberries, and citrus and other subtropical fruits. The chemicals recommended for control and severity estimates in the various States are tabulated, and the symptoms, history, and biology of the more important diseases are described.

Chapter V deals with cucurbit diseases. Downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) [ibid., 31, pp. 226, 368, 542] can be checked completely by three to ten spray applications, the timing depending on the season. Anthracnose (*Colletotrichum lagenarium*) [loc. cit.] occurs in all the major producing areas east of the Rocky Mountains, losses of melons and watermelons ranging up to 75 per cent. Scab (*Cladosporium cucumerinum*) inflicts heavy losses in many cucumber-producing areas of New York and the North Atlantic area [ibid., 30, p. 504]. It is a major problem wherever it occurs on this host and on melons.

The principal diseases of potato, tomato, [chilli] pepper, and eggplant are dealt with in chapter VI, with tabulated data on the control of secondary diseases.

Snap beans [*Phaseolus vulgaris*] and Lima beans [*P. lunatus*], groundnuts and other edible legumes, and vegetables are treated similarly in chapter VII.

In chapter VIII the value of vegetable seed treatment is discussed, with notes

on the materials and methods used for the crops mentioned in chapters V, VI, and VII, and also maize [ibid., 31, p. 264] and tabulated data on the treatment and severity of the principal diseases requiring seed treatment of these and related crops.

In chapter IX soil disinfection and tuber treatment are discussed in relation to the control of diseases of potato and sweet potato and general soil parasites (fungi and bacteria). Tabular lists are given of the diseases requiring tuber, sprout, root, or soil treatment in the various States and the chemicals employed.

The history and uses of fungicides developed from copper, mercury, and inorganic zinc compounds, and metallic chromium complexes [ibid., 31, p. 341] are traced in chapter X. The [annual] consumption of copper for fungicides in the United States is estimated at about 21,000,000 lb., of which the potato, apple, peach, grape, citrus, and tomato crops require 43, 19, 5, 4, 3, and 3 per cent., respectively, and seed disinfectants 7 per cent. About 152,000 lb. mercury are used each year for synthesizing fungicides, including 85,000 lb. for organic mercurials and 59,000 lb. for mercuric chloride; 48 per cent. of the chloride is used on cereal seed, 26 on potatoes, 18 on cotton, and 8 on vegetables. The States reporting these fungicides as acceptable for specific crops are tabulated.

Chapter XI is devoted to the fungicidal uses of sulphur and its derivatives. A total of 180,000,000 lb. of sulphur in all forms was estimated to have been used in the United States in 1947. Of all the inorganic sulphurs 62 per cent. is applied to apples primarily to control scab, and 7 per cent. to groundnuts for leaf spots [*Cercospora arachidicola* and *C. personata*: ibid., 29, p. 605]. By 1950 8,000,000 lb. of the dithiocarbamates [ibid., 31, p. 193] were estimated to have been used.

The use of organic fungicides is described in chapter XII under the headings heterocyclic nitrogen compounds, quinones, and phenolic derivatives [ibid., 31, p. 340], with tables listing the States reporting such fungicides as acceptable for the control of diseases of specified crops.

Indexes are provided to the fungicides, crops, and common names of the major diseases dealt with.

Crowdy (S. H.). **The chemotherapy of plant diseases.**—*Emp. J. exp. Agric.*, 20, 79, pp. 187–194, 1952.

This is a useful review (with 38 references) of work on plant chemotherapy [*R.A.M.*, 31, pp. 133, 392, 445, 468], including a short historical review and a survey of past and present treatments of vascular leaf diseases and seeds [ibid., 31, p. 565]. The value of this approach to the control of plant diseases and assessment of the success obtained are discussed.

Tukey (L. D.) & Williams (O.). **A versatile sprayer for experimental purposes.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 343–348, 3 figs., 1952.

At Pennsylvania State College the speed sprayer [*R.A.M.*, 29, p. 158] used for bulk concentrate spraying has been modified to deal with small quantities (50 gals. or less) for experimental plots. A small sprayer is attached to the side of the speed sprayer, which is operated only for its air blast. The small sprayer consists of a 55-gal. oil drum, a Briggs and Stratton 2–2½ H.P. petrol engine, and an Oberdorfer rotary pump, size No. 9. The liquid system of the small sprayer is connected to the manifold of the speed sprayer by a short piece of rubber hose. When working with concentrate sprays at four times concentration the Whirlmist nozzles delivered 11 to 12 gals. per min. at 60 lb. pressure. The speed sprayer tank could be filled with water and used as a supply for the small tank. The small sprayer was also mounted on wheels and used as an independent unit for spraying small fruits and fruit trees about 20 ft. high.

Aldrich (D. G.). **A pressure apparatus for tree injection.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 349–351, 1 fig., 1952.

A description is given of a pressure apparatus for tree injection [cf. *R.A.M.*, 25, p. 111] consisting of a 2-gal. type TU Binks pressure paint spray tank which serves as a reservoir for the injection fluid. It is constructed for 110 lb. working pressure. Air pressure is supplied by a portable 50 gals. capacity Essick compressor containing a 1 H.P. air-cooled engine and a one-cylinder, air-cooled compressor. Three $\frac{5}{8}$ in. pressure conducting hoses and valves attached to a manifold are connected by a pressure hose to the outlet valve on the reservoir. Attached to the end of each conducting hose by a coupling is a nipple which can be screwed into holes drilled into the tree. An injection pressure of 75 lb. per sq. in. caused no bark injury. One important advantage of the apparatus is that any selected working pressure remains constant, unless re-regulated during injection, regardless of the volume of fluid in the reservoir.

Zentmyer (G. A.). **Chloranil, a coined name for the fungicidal chemical tetrachloro-para-benzoquinone.**—*Phytopathology*, 42, 5, p. 288, 1952.

The Special Committee on Fungicide Nomenclature of the American Phytopathological Society, co-operating with the Interdepartmental Committee on Pest Control, has approved the adoption of chloranil [*R.A.M.*, 30, p. 528] as a name for the pure chemical tetrachloro-para-benzoquinone [ibid., 31, p. 340].

Jinks (J. L.). **Heterokaryosis : a system of adaptation in wild fungi.**—*Proc. roy. Soc.*, Ser. B, 140, 898, pp. 83–99, 1 pl., 4 graphs, 1952.

In studies at the Department of Genetics, University of Birmingham, four of seven wild isolates of *Penicillium cyclopium* [see next abstract] were found each to carry two genetically different kinds of nuclei. These heterokaryons sometimes showed the counterpart of heterosis in having an effective advantage in growth, maintained over a range of substrates, over the constituent homokaryons. This may explain why heterokaryosis has become a feature of the fungi imperfecti with the loss of the sexual cycle. Cultural studies demonstrated that in wild *Penicillium* spp. [*R.A.M.*, 28, p. 298] heterokaryosis serves as a system of limited somatic variation [cf. ibid., 31, p. 567] and adaptation suited to the needs of a saprophytic fungus living on various and often changing substrates. Dikaryons of heterothallic basidiomycetes [ibid., 31, p. 503], while falling under the general heading of heterokaryons, differ from the wild ones of *Penicillium* spp. both in their past development and present function.

Rees (H.) & Jinks (J. L.). **The mechanism of variation in Penicillium heterokaryons.**—*Proc. roy. Soc.*, Ser. B, 140, 898, pp. 100–106, 3 figs., 1952.

In a cytological investigation of *Penicillium cyclopium* [see preceding abstract] at the Department of Genetics, University of Birmingham, older cells of hyphae were found to contain one to three nuclei, while those immediately at the tips of young growing hyphae had 15 or more. All the mitoses observed occurred in these same cells at the growing tips and were simultaneous for a number of adjacent nuclei in homokaryons and stable heterokaryons. Readjustment of the nuclear ratios and therefore of genetic balance, occurring within the tip cells, arises by differential rates of division of the two kinds of nuclei. The genetic balance thus established at the tips could operate in older cells through the cytoplasm inherited by the latter, or by inter-cell co-operation between nuclei through the medium of cytoplasmic channels between the cells.

Hewitt (E. J.). **Sand and water culture methods used in the study of plant nutrition.** —*Tech. Commun. Bur. Hort., E. Malling*, 22, x+241 pp., 9 pl., 25 diags., 1 graph, 1952 (published by Commonwealth Agricultural Bureaux, Farnham Royal, Bucks.). 42*s*.

The first part of this valuable treatise is devoted to a general and comprehensive review and assessment of the numerous sand and water culture methods used in the study of plant nutrition, and part II to a detailed description of current methods in use at Long Ashton Research Station for growing plants in large-scale pot sand cultures [*R.A.M.*, 31, pp. 32, 417], together with information on the materials used, their source, and manipulation. Special attention is paid to methods of studying micronutrient deficiency problems, including the selection of appropriate materials, preparation of pure solutions of nutrient reagents, and sources of trace contamination. The terms 'macronutrient element' and 'micronutrient' are defined with examples. Elements of indeterminate status, such as aluminium, gallium, silicon, chlorine, cobalt, and vanadium, are sometimes termed potential micronutrients. A comprehensive combined bibliography and author index, and a subject index are provided.

Rawlins (T. E.) & Takahashi (W. N.). **Technics of plant histochemistry and virology.**—ix+125 pp., 1 fig., 13 diags., 3 graphs, Millbrae, California, The National Press, 1952. $3.50. [Lithographed.]

This book brings together material of the authors' lectures on plant histochemistry and virology and serves as a text for a course in advanced technique at the Plant Pathology Division, University of California, Berkeley. It deals chiefly with the histochemical detection of various compounds in plant cells and cell walls, with a discussion on their location, fine structure, and function in both healthy and diseased tissues. The polarizing microscope and many applications of its use are described, including those for studying the fine structure of cell constituents and the identification of crystalline compounds, with detailed directions in simple form for the benefit of those without training in micropetrography. A section (pp. 95–113) is devoted to modern virus techniques and short ones to X-rays, statistics, photography, and photomicrography. Besides providing laboratory training in phytopathological methods, the book may also serve as a useful reference and research handbook for plant anatomy and biochemistry, and wood technology. There are nearly six pages of references.

Miller (P. R.) & O'Brien (Muriel). **Plant disease forecasting.**—*Bot. Rev.*, 18, 8, pp. 547–601, 1952.

The authors review (with 11 pages of references) the available information on plant disease forecasting services in actual operation throughout the world [cf. *R.A.M.*, 31, p. 73], the diseases dealt with, country by country, being apple and pear scab (*Venturia inaequalis* and *V. pirina*) [cf. ibid., 29, p. 157; 31, p. 496], vine mildew (*Plasmopara viticola*) [cf. ibid., 29, p. 157; 30, p. 505; 31, p. 167], potato and tomato blight (*Phytophthora infestans*) [cf. ibid., 30, p. 451; 31, p. 77], grain crop diseases, sugar beet diseases, and factors affecting cranberry keeping quality. A section (pp. 583–588) is devoted to research work contributing to forecasting, with special reference, *inter alia*, to the spread of potato viruses in relation to aphid populations [cf. ibid., 31, p. 200], the incidence and build-up of tobacco blue mould (*Peronospora tabacina*) [cf. ibid., 31, p. 150], disease progression as an index of the future of a perennial crop in the case of lucerne bacterial wilt (*Corynebacterium insidiosum*) [cf. ibid., 18, p. 258], correlation between rainfall and incidence of *Phymatotrichum omnivorum* on cotton [cf. ibid., 18, p. 106], spread of chestnut blight (*Endothia parasitica*) [cf. ibid., 5, p. 642; 30, p. 438; 31, p. 638], and

infection phenomena studies in relation to disease spread [cf. ibid., 28, p. 296; 31, p. 251].

Tisdale (W. B.). **What's new in plant pathology.**—*Plant Dis. Reptr*, 36, 5, pp. 208–210, 1952. [Multilithed.]

In this paper read before a general assembly of the Association of Southern Agricultural Workers in Atlanta, Georgia, on 4th February, 1952, the author briefly reviews the changes during the past 10 years in incidence and importance, and new developments in the control of various plant diseases, mainly in the southern United States, the subjects including tree diseases, field crops, seed treatments, vegetable crops, and virus diseases. New resistant varieties are noted.

Johnston (H. W.). **Technique for obtaining aseptic seedlings.**—*N.Z. J. Sci. Tech.*, Sect. A, 33, 6, pp. 87–91, 2 figs., 1952.

The author describes the construction and operation of a piece of apparatus for the sterilization of seeds, developed at the Soil Bureau, Department of Scientific and Industrial Research, Wellington, New Zealand, which permits the separate processes of surface decontamination with alcohol, washing with sterile water, and subsequent treatment with the desired sterilizing agent to be carried out without admitting non-sterile air into the apparatus. After treatment the seeds are removed from the apparatus under a sterile hood and placed on agar for germination. Sterile seedlings of lupin and oats were obtained by seed treatment with 1 per cent. aretan for one hour, oats and wheat with 6·6 per cent. calcium hypochlorite for 20 minutes, and mustard with 0·25 per cent. mercuric chloride for 2 minutes.

Wright (Joyce M.). **Production of gliotoxin in unsterilized soil.**—*Nature, Lond.*, 170, 4329, pp. 673–674, 1952.

At the Butterwick Research Laboratories, Welwyn, Herts., unsterilized Wareham Heath soil (a highly acid podsol) was supplemented with dried clover, inoculated with a spore suspension of a gliotoxin-producing strain of *Trichoderma viride* [*R.A.M.*, 31, pp. 449, 514 and below, p. 47], and incubated for four days at 25° C. The antibiotic was identified by the following bio-assay. Filter-paper chromatograms were made of ether extracts of the soil and solutions of pure gliotoxin, and then placed on agar seeded with *B*[*acillus*] *subtilis* and incubated. The amount of gliotoxin present was estimated roughly from the size of the inhibition zone.

Activity took place only in inoculated unsterilized soil to which dried clover had been added and was attributed to gliotoxin production as the results were closely analogous to those obtained with the pure product. At an approximate estimate 0·6 μgm. gliotoxin per gm. of soil was produced following the addition of 5 per cent. clover. Activity was demonstrated in a neutral garden loam treated similarly and inoculated with *T. viride* only after acidification.

Macmillan (W. G.), Bose (R. G.), & Bhattacharyya (J. P.). **A note on a copper tolerant Penicillium. Part I—some preliminary observations.**—*Sci. & Cult.*, 18, 2, pp. 94–95, 1952.

In studies at the Microbiological Laboratory, Indian Jute Mills Association Research Institute, Calcutta, an interesting species of *Penicillium*, No. 153.1, resembling the description of *P. ochrochloron*, was isolated from a cuprammonium proofed jute bag and was found to be highly resistant to copper [cf. *R.A.M.*, 24, p. 381]. When grown on liquid media containing Czapek-Dox salts with 3 per cent. sucrose and copper concentrations varying from 0·1 to 4 per cent., the final intensity of sporulation varied from a trace to zero, respectively, the mycelial weight at the highest copper concentration being 103·5 mgm. as against 91·4

mgm., when no copper was included. This species also tolerates sulphuric acid (up to 0·1 per cent.), low concentrations of both chemicals apparently accelerating the mycelial growth and sporulation of the fungus.

Stern (A. M.). **Studies on the physiology of the Mucor mucedo and its role in the fermentation of Soybean curd.**—*Diss. Abstr.* (formerly *Microfilm Abstr.*), 12, 1, p. 6, 1952. [Mimeoprinted.]

At the University of Illinois it was found that the introduction of 1·5 parts of a spore suspension of *Mucor mucedo* [*R.A.M.*, 27, p. 250] to one part soy flour produced a pliable but firm soy-bean cake which, with proper handling, ripened without objectionable contamination [ibid., 31, p. 505].

Casey (J. P.). **Pulp and paper. Chemistry and chemical technology. Volume I: pulping and papermaking.**—xxiii+795 pp., 12 figs., 12 diags., 74 graphs, New York and London, Interscience Publishers, 1952. $15.00.

Chapter XIV (pp. 654–706) of this treatise deals with microbiology, which is stated to have assumed immense importance to the paper chemist of recent years. Fungi occurring in paper mill systems are listed and very briefly treated. The effects produced by micro-organisms in the pulp system are described, including slime formation (partly of fungal origin), relation of environmental factors to the growth of micro-organisms, sources of contamination in the mill system, influence of mill conditions, control in the pulp system (comprising the latest developments in the application and evaluation of toxicants [*R.A.M.*, 29, p. 524 *et passim*]), microbiological requirements of paper and paper-board [ibid., 31, p. 345], and micro-organisms in non-fibrous materials.

Barton-Wright (E. C.). **The microbiological assay of the vitamin B-complex and amino acids.**—x+179 pp., 25 graphs, London, Sir Isaac Pitman & Sons, Ltd., 1952. 18*s*.

Included in this treatise, which embodies recent advances in the application of the microbiological assay method to the biochemical analysis of the vitamin B-complex and amino acids, are references to the use for this purpose of mutants of *Neurospora crassa* and *N. sitophila* [*R.A.M.*, 25, p. 310], yeasts, and *Phycomyces blakesleeanus* [ibid., 15, p. 169]. Part I comprises a general survey of the development of microbiological assay and methods of procedure, part II deals with the microbiological assay of vitamins, and part III treats of the microbiological assay of amino acids. Each chapter is followed by bibliographical references.

Webley (D. M.), Eastwood (D. J.), & Gimingham (C. H.). **Development of a soil microflora in relation to plant succession on sand-dunes, including the 'rhizosphere' flora associated with colonizing species.**—*J. Ecol.*, 40, 1, pp. 168–178, 1952.

It was aimed in this investigation to follow the development of a soil microflora during the progress of succession, from the colonization of bare areas by flowering plants to a relatively complex community. The sequence of communities on sand-dunes at Newburgh, Aberdeenshire, and Tentmuir, Fife, was selected, particular attention being given to the demonstration and analysis of 'rhizosphere' floras [*R.A.M.*, 30, pp. 223, 575] associated with colonizing species and the successive dominants of early stages in the succession.

Bacterial and fungal populations showed a marked increase with the start of plant colonization. The colonization of dune pasture areas by heather (*Calluna vulgaris*), however, was accompanied by a fall in bacterial numbers, though the fungus population continued to rise in dune heath and pine plantations.

'Rhizosphere' floras were demonstrated round the root systems of sand-dune plants, the numbers of micro-organisms obtained from the rhizosphere sand being much larger than those from uncolonized foreshore sand.

The following technique was employed for separating the floras of the root surface and of the rhizosphere proper. Young, well-established grass plants, having three to six tillers but no rhizome initials, were transferred to flasks containing a known volume of 0·85 per cent. sterile saline with the entire root system and adhering sand in the solution. The root system (freed from sand) was then transferred aseptically to a similar flask containing saline plus 10 gm. sterile sand. A third flask contained sand collected away from the plant. After shaking, the solutions were diluted and plates prepared, all containing 1 ml. of the dilution, while some had 5 ml. Topping's medium (*Zbl. Bakt.*, Abt. 2, 97, p. 289, 1937) for bacteria and the others 8 ml. Waksman's agar for fungi.

Fungus floras were relatively uniform, with a species of *Cephalosporium* prominent, especially in association with *Ammophila arenaria*.

Kobel (F.). **Untersuchungen über toxische Stoffwechselprodukte von Nectria cinnabarina (Tode) Fr.** [Studies on the toxic metabolic products of *Nectria cinnabarina* (Tode) Fr.]—*Phytopath. Z.*, 18, 2, pp. 157–195, 1 diag., 12 graphs, 1951.

Starting from a premise suggested by a study of the literature, that the typical symptoms of infection by *Nectria cinnabarina* on its many woody hosts point to the secretion of a wilt toxin [cf. *R.A.M.*, 2, p. 320; 28, pp. 39, 526], the author examined four strains of the pathogen and a *Fusarium* (probably belonging to the section *Lateritium*) from this angle at the Federal Technical Institute, Zürich, Switzerland. Two of the *N. cinnabarina* isolates, from apricot and red currant, both in local gardens, yielded active culture filtrates, while the other two, from *Acer palmatum* var. *thunbergii* and apple, and the *Fusarium* from *Robinia pseudo-acacia*, were inactive. The active culture filtrates inhibited the mycelial growth of *Pythium debaryanum* and spore germination in *Ustilago zeae* [*U. maydis*]; the latter property served as a basis for the quantitative assay of toxin production and chemical analyses of the filtrate.

The optimum temperature for toxin production was about the same as for mycelial growth, i.e., 24° C. Richards's solution, supplemented by 5 per cent. glucose, proved superior to Czapek's or Raulin's for toxin production by *N. cinnabarina*. The addition of substances promoting fungal growth, especially vitamin B_1, inhibited the secretion of the active principles, which were found to consist of an acid and an alkaline component. In tests on red currant branches the culture filtrate induced the typical symptoms observed on a naturally diseased plant, namely, flaccidity and necrotic lesions. The acid component causes only necrosis, the alkaline both symptoms. The toxins could be demonstrated in a pressure-induced transpiration stream. Transport through the wood inactivated a part of the total toxin. Leaves into which the culture filtrate was forced by pressure developed no pathological symptoms, so that disturbances in the water supply must be responsible for the wilt in natural infection. The necrotic lesions are of toxigenic origin. The isolated toxins act non-specifically on plants and possess no anti-bacterial properties.

Steineck (O.). **Der hydroponische Stecklingstest. Ergebnisse bisheriger Erfahrungen und neuerer Untersuchungen.** [The hydroponic cutting test. Results of previous experiences and recent studies.] *Bodenkultur*, 5, 2, pp. 161–173, 4 figs., 1951.

Details are given of attempts to improve the technique of the hydroponic cutting test for the diagnosis of potato viruses [*R.A.M.*, 31, p. 571], e.g., by a reduction in

the nitrogen content of the nutrient solution and the interruption of dormancy by the application of thiourea to freshly lifted tubers. Individual pots were found to be preferable to tanks for the cultivation of the cuttings. The presence of leaf roll virus may be detected by examination of the root system of hydroponic cuttings at an early stage, marked differences between diseased and healthy plants being apparent by the 10th day and increasing up to the 15th.

Hollis (J. P.). **Studies on Streptomyces scabies. I. Variability in a melanin-indicator medium.**—*Phytopathology*, 42, 5, pp. 273–276, 1 fig., 1 graph, 1952.

At the Department of Botany, University of Missouri, Columbia, a strain of the potato scab organism, *Streptomyces* [*Actinomyces*] *scabies*, from Hooker [*R.A.M.*, 28, p. 539] produced abundant melanin pigment in a specially enriched tyrosine medium. The parent isolate gave rise to three types of colonies on a minimal melanin-indicator medium plus yeast: A, small with a narrow and intense melanin-diffusion ring; B, large with weak melanin-diffusion zones and meagre to profuse development of aerial hyphae in three to five days; and C, albino (grey or white), with a variable amount of aerial mycelium and no exogenous melanin production, although mutants may exhibit some darkening of the spores. Type C arises through mutation from A and B, averaging 0·2 to 1 per cent. of the total colonies assayed.

Lutz (J. M.). **Influence of temperature and length of curing period on keeping quality of Porto Rico Sweetpotatoes.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 421–425, 1952.

Experiments carried out from 1944 to 1948 at the United States Department of Agriculture Horticultural Field Station, Meridian, Mississippi, to determine under simulated commercial conditions and at different temperatures the optimum curing period for sweet potatoes [cf. *R.A.M.*, 14, p. 118; 23, pp. 54, 499; 31, p. 101] showed that nearly all the decay was due to *Rhizopus* [spp.: ibid., 23, p. 54]. Decay was less after curing at 84° F. than at any other temperature used, though at 90° there was only slightly more. Curing for four days was ample.

Hughes (M. B.) & Aycock (R.). **Sweet Potato clones resistant to internal cork.**—*Proc. Amer. Soc. hort. Sci.*, 59, pp. 433–438, 1952.

When mother roots of eight sweet potato clones were inoculated with internal cork virus [*R.A.M.*, 31, p. 455] by core-grafting at Edisto Experiment Station, South Carolina, roots of the variety Porto Rico developed severe corky spotting, those of clones E7, 11-20, 11–146, 262-33, B 5999, and Allgood showed little or none, and 45–25–3 appeared to give an intermediate response.

Chowdhury (S.). **Studies in the bunt of Rice (Oryza sativa L.).**—*Indian Phytopath.*, 4, 1, pp. 25–37, 1 fig., 4 graphs, 1951.

Bunt caused by *Neovossia horrida* [*R.A.M.*, 27, p. 468] is common and widespread on rice in Assam [ibid., 27, p. 411], occurring in all the rice-growing areas of the State and infecting all groups, namely 'ahu' (summer rice), 'sail' or 'sali', 'asra' and 'aman' (winter rice), and 'boro' (spring rice). Surveys during the past six years indicated that it is negligible on 'ahu' and 'boro' but the percentage of affected 'aman' and 'asra' plants varies generally from 0·05 to 1·5, reaching 17·5 in 'sali'. The number of bunted grains per ear is two to four and two to five in these groups, respectively.

In severe infection a short, beak-shaped or inverted, spur-like outgrowth (the shrunken remnant of the endosperm) is occasionally produced by the rupturing of any portion of the keel of the larger glume or lemma.

A comparison between 400 healthy and 400 diseased plants revealed no difference

in height or number of tillers. Field observations indicated that disease development is influenced by climatic conditions, particularly by the occurrence of frequent, light rainfall and humid weather during the latter part of October and early November when the plants are in flower. 'Sali' is probably infected more severely than 'aman' and 'asri' because these varieties are grown in low-lying tracts in deep water whereas 'sali' grows above the water on banks where the spores lie dormant.

Experiments in 1946 on possible modes of transmission established definitely that the disease is not seed- or soil-borne, but originates from flower infection [loc. cit.]. Ears of the varieties Latisail, Kerrsail, Nagrasail, and Swarnasail were bagged and infected with sporidia when anthesis commenced, the controls being bagged but not infected. The percentage infection in each variety was 45, 89, 78, and 52, respectively, in the inoculated series and nil in the controls. Similar results were obtained in 1947, 1949, and 1950. In nature the spores from the previous season remain in the soil or on rice stubble and germinate under favourable conditions, producing numerous sporidia which are carried to the ears by wind.

Hingorani (M. K.) & Prasad (N.). **Seedling blight of Rice in Sind.**—*Indian Phytopath.*, 4, 1, pp. 60–63, 1951.

Over 500 isolations from discoloured leaves, kernels, and seedlings of rice plants in Sind, India, affected by seedling blight and leaf spot demonstrated the prevalence of *Curvularia lunata* [*R.A.M.*, 29, p. 329], *Cochliobolus* [*Ophiobolus*] *miyabeanus* [ibid., 30, p. 262; 31, p. 294], and a small-spored *Helminthosporium*, probably a new variety of the imperfect state (*H. oryzae*) of the foregoing species. The pathogenicity of these species was established by inoculating sterilized seeds of the susceptible variety Kangni 27 with a spore suspension of each fungus. Up to 80 per cent. infection occurred with *C. lunata* and *O. miyabeanus*, 72 per cent. with the *Helminthosporium* sp., and none at all in the uninoculated controls.

Blighted seeds were treated at the recommended rates with semesan, granosan [ibid., 31, p. 372], uspulun [ibid., 31, p. 575], red copper oxide, ceresan [loc. cit.], and agrosan, or left untreated, and sown in pots and in the field. The percentages of seedling blight developing in the pots were 3, 5, 14, 6, 4, 2, and 29 respectively, and in the field 4, 4, 6, 9, 7, 3, and 31, respectively. It appears, therefore, that the seedling blight phase can be controlled by chemicals, but breeding of resistant varieties [ibid., 31, p. 55] is the best remedy for secondary infection.

Ramiah (K.), Ghose (R. L. M.), & Vachhani (M. V.). **Improvement of Rice in India.**—*Emp. J. exp. Agric.*, 20, 79, pp. 161–174, 1952.

In the section on breeding for disease resistance in this article (p. 165) two new rice varieties resistant to blast (*Piricularia oryzae*) [*R.A.M.*, 21, p. 362; 31, pp. 54, 399, 575] are listed: CO. 25 and CO. 26. They have been developed at the Central Rice Research Institute, Cuttack, India, have all the desirable agronomic features, and are now being grown extensively in cultivators' fields.

Joshi (N. V.) & Joshi (S. G.). **Effect of copper sulphate on Rice in the Bombay State.**—*Sci. & Cult.*, 18, 2, pp. 96–97, 1952.

In pot experiments with poor soils from different localities in Maharashtra and Konkana, Bombay State, soils from the districts of Poona, Kolaba, and Ratnagiri responded well to copper and zinc. Thus, the addition of copper sulphate gave 33 per cent. increase in wheat yield, gross dry weight (grain and straw) being 33·81 gm. as against 24·87 gm. for the control, while the addition of copper sulphate with organic manure resulted in a 77 per cent. increase (54·34 gm.) over that obtained with organic matter alone (30·48 gm.). As a result of these experiments field trials were carried out in which an application of copper sulphate (1 lb. per acre) to the soil in which rice seedlings were grown for transplanting in the Kolaba district

resulted in an increase of about 7·5 maunds [1 maund = 37·327 kg.] per acre, i.e., 37·5 per cent. yield increase over the untreated area. For the Ratnagiri district the yields from treated and untreated areas were 11 and 5 maunds, respectively. Copper sulphate is recommended, but only for small areas, in all parts of India where seedlings are grown for transplanting. The use of micro-nutrients is more economical in such areas.

KANDIAH (S.). **Potash deficiency in Paddy.**—*Trop. Agriculturist*, 108, 1, p. 48, 1952.

Potassium deficiency of rice [cf. *R.A.M.*, 31, p. 140] as indicated by leaf spot is moderately prevalent in peaty or sandy soils along the western coast of Ceylon and in Unnichchai, Karadianaru, and Vakaneri in the Batticaloa District. The application of potassium fertilizers has eliminated the symptom. At Mirigama the trouble is known as 'bronzing'; no leaf spots are present, but the entire leaf turns brown from the tip and dies. The affected leaves are markedly deficient in potassium. Application of muriate of potash had some beneficial effect, but improvement was not commensurate with the amount applied. Further investigations are in progress.

NISIKADO (Y.), NAKAYAMA (T.), & MIYAWAKI (Y.). **Studies on the methods for testing the effectiveness of fungicides. I. The use of slide glasses as a medium for testing spray materials.**—*Ber. Ōhara Inst.*, 9, 3, pp. 317–328, 1951.

In experiments at the Ōhara Institute, Kurashiki, Japan, glass slides were sprayed for five seconds at a distance of three feet with test solutions of various fungicides by means of a pistol atomizer connected to a motor-driven air compressor adjusted to 5 lb. per sq. in. They were then treated with spore suspensions of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*], *Piricularia oryzae*, and *Gibberella saubinetii* [*G. zeae*], placed in a saturated atmosphere, and records taken of spore germination and germ-tube length on a scale varying from 0 to 5 and 0 to 3, respectively [cf. *R.A.M.*, 31, p. 25].

No fungicide inhibited the germination of *O. miyabeanus* completely. Bordeaux mixture, San Bordeaux (14·2 per cent. copper), and Kassei Bordeaux (9·2 per cent. copper plus aluminium sulphate) were successful at 0·4 per cent. but Ōdo (copper hydroxide plus copper chloride, 39·8 per cent. copper) and kupoid (copper hydroxide plus copper silicate, 17·2 per cent. copper) were effective only at 0·8 per cent. Germ-tube growth was greatly retarded at 0·1 per cent. by all the copper fungicides used. Only Bordeaux (0·4 per cent.) inhibited spore germination of *P. oryzae* but germ-tube development was generally somewhat suppressed, especially by the copper compounds and to a slight extent by non-copper fungicides. Both Bordeaux and San Bordeaux inhibited *G. zeae* at 0·1 per cent. and the other copper compounds at 0·4 per cent. Germ-tube growth was also conspicuously retarded at the lower concentration.

There was no marked effect of ageing of spray residues on efficiency up to 60 days. The slides were placed in distilled water renewed twice daily to test the adhesion of the residue. At 0·8 per cent. Bordeaux mixture required from two to four days' constant exposure before losing its efficiency but at 0·4 per cent. the time required was 24 hours. San Bordeaux appeared to lose its effectiveness sooner than Bordeaux, particularly at the higher concentration.

NISIKADO (Y.), NAKAYAMA (T.), MIYAWAKI (Y.), & ŌSHIMA (S.). **Studies on the methods for testing the effectiveness of fungicides. II. The use of pot cultured Rice plants for testing spray materials against Helminthosporium oryzae infection.**—*Ber. Ōhara Inst.*, 9, 3, pp. 377–381, 1951.

In a further study in this series [see preceding abstract] solutions of 13 fungicides were sprayed on to seedlings and mature rice plants growing in galvanized iron

pots for control of leaf spot induced by spraying with a spore suspension of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, 31, p. 294]. Infection was rated on a scale varying from 0 to 4 for seedlings and 0 to 5 for mature plants. Although both types of plants were equally suitable, seedlings were more useful from a practical viewpoint and could be used for additional tests after the tops had been clipped off. Bordeaux mixture was the outstanding material, being effective even at 0·05 per cent. Other copper products were also effective but only at concentrations of 0·5 per cent. or more. Consistently close results were obtained with seedling and adult plants.

Fukaya (M.). **On the theoretical bases for predicting the occurrence of the Rice stem borer in the first generation.** —*Ber. Ōhara Inst.*, 9, 3, pp. 357–375, 6 graphs, 1951.

Studies at the Ōhara Institute, Kurashiki, Japan, on the hibernating of larvae of the rice stem borer (*Chilo simplex*) showed that the high mortality in May and June is due mainly to infection just before pupation by *Beauveria bassiana* [cf. *R.A.M.*, 3, p. 517], aggravated by conditions of high temperature and humidity.

Green (V. E.) & Stoner (W. N.). **Rice culture on muck soils of the Everglades.**—*Rice J.*, 55, 9, pp. 8–10, 12, 4 figs., 3 graphs, 1952.

In preliminary trials at the Everglades Experiment Station, Belle Glade, Florida, poor condition of rice plants was corrected by a ferric tartrate or ferrous sulphate spray. Heading was brought forward and accelerated with increasing amounts of ferrous sulphate up to 1,000 lb. per acre. Although 800 lb. aluminium sulphate, by increasing iron uptake, was equivalent in action to 300 lb. iron salt, it is not recommended for acid mineral soils.

Jacks (H.) & Smith (H. C.). **Soil disinfection. XII. Effect of fumigants on growth of soil fungi in culture.**—*N.Z. J. Sci. Tech.*, Sect. A, 33, 6, pp. 69–73, 2 figs., 1952.

A description is given of the method used for studying the effect of various fumigants on the growth of soil fungi in culture [*R.A.M.*, 29, p. 269] during further investigations on soil disinfection [cf. ibid., 31, p. 522] in New Zealand. Quart jars containing prune or potato dextrose agar were inoculated with one of the following: *Verticillium dahliae*, *Phytophthora cryptogea* (both isolated from tomato stems), *V. albo-atrum*, *Sclerotinia sclerotiorum*, and *Colletotrichum atramentarium* (potato stems), *Fusarium oxysporum* var. *aurantiacum* (wilted cucumber stems), *F. lini* (wilted linen flax stems), *Corticium solani* (potato tubers), *P. cactorum* (gooseberry bark), and *Pythium ultimum* (tomato seedlings), so that colonies of the same size (one-eighth to one-quarter of the jar diameter) were obtained. The jars were inverted, the test fumigant in a glass dish being placed inside the lid on a rubber-lined sealing disk for 48 hours, and kept at room temperature, i.e., 16°±4° C. A colony not resuming growth 14 days after exposure to fumigants was considered killed. Chloropicrin at the lowest dosages tested (3 to 4 p.p.m. of jar volume) killed all the test fungi except *V. dahliae*. Shell D-D (3 and 10 p.p.m.) was more effective against *Fusarium*, *Phytophthora*, and *Pythium* spp. than against the other fungi tested. Dowfume N, ethylene dibromide, ethylene dichloride, and dowfume 40 were less satisfactory.

Sadasivan (T. S.). **Role of trace elements in control of root-infecting fungi.**—*Proc. Indian Acad. Sci.*, Sect. B, 33, 3, pp. 135–149, 6 graphs, 1951. [Received October, 1952.]

In this paper, presented at the Seventh International Botanical Congress, Stockholm, 1950, the author collates and discusses the results obtained by Yogeswari [*R.A.M.*, 28, p. 233] (and Ph.D. thesis, University of Madras, 1950), Sarojini

[see above, p. 23], and Sulochana (M.Sc. thesis, University of Madras, 1950), all working at the University Botany Department, Madras, on the role of certain trace elements on the growth in pure culture of *Fusarium vasinfectum*, *F. udum*, and *F. moniliforme* [*Gibberella fujikuroi*], and also on the saprophytic and parasitic activity of these fungi in nutrient-amended wilt-sick soils.

In 1950 Yogeswari demonstrated increased metabolism of and accumulation of potassium in the mycelium when zinc was added compared with cultures to which boron was added and the control. Sucrose consumption from identical substrata was quantitatively greater when boron was present than when zinc was given, though the amount utilized by the fungi was greater in the latter case than the former.

Sulochana considerably extended the list of micro-elements employed by Sarojini and studied the effect of colonization and survival of *F. vasinfectum* on buried cotton root-pieces and of micro-nutrient elements on sporulation of the fungus in pure culture. Lithium and molybdenum exhibited a maximum inhibitory effect on micro- and macroconidial production. Of the eight elements tested, boron (at 80 p.p.m.) inhibited the saprophytic activity of the fungus by reducing both the percentage colonization on root pieces and the percentage survival in them over a period of 24 weeks' incubation. The work also demonstrated that quantitatively the bacterial population of the various nutrient-amended soils showed varying degrees of response, the maximum increase being brought about by the addition of manganese, the others following in the order boron, molybdenum, lithium, zinc, cobalt, aluminium, and nickel. Nevertheless, boron was more beneficial than manganese as regards effective control of colonization and saprophytic activity, since it suppressed sporulation as well as increasing microbial antagonism in soil.

Steaming on way out in Holland.—*Fruit Gr., 1952*, 2968, p. 903, 3 figs., 1952.

A description is given of a method of soil sterilization by chemicals [*R.A.M.*, 31, p. 314] which has been practised in Holland for the past three years and was recently demonstrated in the Lea Valley, Herts., by Messrs. Aeromist Ltd., of Worthing, Sussex. A two-wheel tractor carries two tanks containing the chemical, which is fed by gravity to a boom with five vertical outlets. These are dragged through the soil at a depth of six to eight inches, each outlet being individually controlled. The firm hopes to put into the field in the coming season a limited number of teams operating the machines for the benefit of growers.

Experiments with chloropicrin against *Verticillium* and *Fusarium* spp. showed this method to be superior to steam sterilization in that it was more economical both financially, costing about £60 for 10,000 sq. ft., and in time and man-power, two men being able to disinfect an acre in one day. After application the soil must be sealed with water for a minimum of four days; planting may follow four to eight days later (on light soil) or eight to ten (on heavy).

David (P. A.). **The Black Pepper culture in the College of Agriculture at Los Baños.**—*Philipp. Agric.*, 35, 3, pp. 130-136, 2 figs., 1951. [Received September, 1952.]

Of the diseases affecting black pepper (*Piper nigrum* var. *trioicum*) in the Philippine Islands, anthracnose (*Colletotrichum nigrum*) [*Glomerella cingulata*: *R.A.M.*, 19, p. 728] is seldom of economic importance. *Dematophora* [*Rosellinia*] *necatrix* has been reported.

Gupta (S. C.) & Sinha (S.). **Further additions to the Synchytria of India.**—*Indian Phytopath.*, 4, 1, pp. 7–10, 1 pl., 1951.

Five new species of *Synchytrium* collected near Agra, India [cf. *R.A.M.*, 31,

p. 402], from 1948 to 1950 are described. *S. phaseoli-radiati* on *Phaseolus radiatus*, *P. mungo* [cf. ibid., 28, p. 559], pigeon pea, and *Crotalaria juncea* has resting sporangia measuring 165 to 200 (mean 184) μ in diameter with a wall 13 to 16·5 μ thick. For *S. hibisci* on *Hibiscus esculentus* these measurements were 182 to 210 (mean 200) μ and 20 μ; for *S. melongenae* on eggplant 56 to 76 (mean 66) μ and 8 to 10 μ; and for *S. sesami* on sesame 172 to 201 (mean 188) μ and 10 to 13 μ, respectively.

Patel (M. J.), Gokhale (V. P.), & Kulkarni (N. B.). **Additions to fungi of Bombay—I.**—*Indian Phytopath.*, 4, 1, pp. 64–66, 1951.

This critically annotated list contains descriptions of five fungi collected in Bombay, including *Tolyposporium andropogonis* n.sp. on *Andropogon triticeus* at Poona.

Patel (M. K.), Payak (M. M.), & Kulkarni (N. B.). **Additions to fungi of Bombay—II. A new Dasturella on Boswellia serrata Roxb.**—*Indian Phytopath.*, 4, 1, pp. 71–73, 2 figs., 1951.

In a further contribution to this series [see preceding abstract] a description is given of *Dasturella boswelliae* n.sp. causing severe rust on leaves of *Boswellia serrata*, a valuable resin-yielding and forage tree, on Vetal Hill, near Poona, during November to December, 1950. The spots are brownish-black, angular, minute, and gregarious, and the uredosori mostly hypophyllous, minute, reddish-brown, and paraphysate. The minutely echinulate, hyaline, obovate to ellipsoid uredospores measure 19 to 32 by 12 to 17 μ, and the hypophyllous, subepidermal teleutosori, catenulate at first, are 150 to 290 μ broad and 76 to 130 μ high. The rectangular to polygonal, reddish-brown, thick-walled teleutospores measure 11 to 33 by 6 to 15 μ, with 10 to 18 spores in each vertical chain.

Gilman (J. C.) & Tiffany (L[ois] H.). **Iowa ascomycetes I. The Xylariaceae.**—*Iowa St. Coll. J. Sci.*, 26, 3, pp. 455–482, 128 figs., 1952.

This annotated list of 34 Xylariaceae found in Iowa includes the following root and stem parasites. *Nummularia discreta* causes blister canker of apple [*R.A.M.*, 20, p. 123] at Ledges, Boone, Iowa City, and Wayne and has also been found on *Amelanchier canadensis* at Ledges and Boone, on pear at Osage, on *Sorbus aucuparia* at Grinnell and Osage, and *Sorbus* sp. in Des Moines County. *Hypoxylon pruinatum*, associated with poplar canker [ibid., 24, p. 255], particularly in fire-damaged areas, has been collected on dead poplar wood at Boone, Ledges, and Decorah. There is a key for the identification of species and genera.

Cooke (W. B.). **Western fungi—II.**—*Mycologia*, 44, 2, pp. 245–261, 3 figs., 1952.

Descriptive and technical notes are given on fungi found in eastern Washington and adjacent Idaho (Part I in *Mycologia*, 41, pp. 601–622, 1950), including *Trichoscyphella tenuipilosa* n.sp. on twigs of pine (*Pinus ponderosa*), *Microsporum gypseum* on buried wool cloth [*R.A.M.*, 30, pp. 238, 282], *Helminthosporium pseudotsugae* n.sp. on bark and resin exudations of *Pseudotsuga taxifolia* var. *glauca*, and *Coccodinium laricis* n.sp. on bark of larch (*Larix occidentalis*). A note is also given on the synonymy, geographical distribution, and host range of *Dothidella janus* and on fungi found on wooden posts and railings in a lava tunnel in Oregon.

Standen (J. H.). **Host index of plant pathogens of Venezuela.**—*Plant Dis. Reptr, Suppl.* 212, pp. 59–106, 1952. [Multilithed.]

This host index of plant pathogens of Venezuela [cf. *R.A.M.*, 14, p. 397; 21, p. 351; 24, p. 74] is based on material that became available when the Mycological Herbarium of the Ministerio de Agricultura y Cria in Caracas was transferred to the offices of the División de Fitopatología at Maracay in 1949 and catalogued for the

first time. Arranged in alphabetical order of the botanical names of the hosts, it includes *Taphrina deformans* on peach [C.M.I. map No. 192], *Ustilago avenae* on oats [ibid., No. 238], *Xanthomonas campestris* on cabbage and other crucifers [ibid., No. 136], *Diaporthe citri* on grapefruit [ibid., No. 126], *Mycosphaerella fragariae* on *Fragaria chiloensis* [ibid., No. 110], *Dothidella ulei* on *Hevea* rubber [ibid., No. 27], *Alternaria solani* on tomato [ibid., No. 89], *Pseudopeziza medicaginis* on lucerne [ibid., No. 129], *Claviceps paspali* on *Paspalum* spp. [ibid., No. 90], *Alternaria solani* on potato [ibid., No. 89], *Spondylocladium atrovirens* [ibid., No. 233] and *Spongospora subterranea* [ibid., No. 34] on potato, *Sphacelotheca sorghi* on sorghum [ibid., No. 220], and *Puccinia glumarum* [ibid., No. 97] and *Urocystis tritici* [ibid., No. 80] on wheat.

Costa (A. S.). **Concentration of Brazilian Tobacco streak virus in infected plants.**—*Phytopathology*, 42, 5, pp. 231–236, 1 fig., 1952.

In tobacco leaves affected by systemic necrosis due to the Brazilian strain of tobacco streak virus [*R.A.M.*, 19, p. 496] the normal tissue between the lesions is not completely invaded. At the Agronomic Institute, Campinas, São Paulo, tests were made for virus activity on samples of Turkish tobacco leaves taken at various intervals up to 27 days after inoculation and showing different types of symptoms, the estimates being based on the number of lesions obtained by inoculation of *Beta patellaris* [ibid., 31, p. 405].

There was a progressive reduction in virus activity with advancing age of the leaves, especially in those with systemic necrosis. In one test, for instance, the numbers of lesions developing on half leaves of *B. patellaris* inoculated with material from two plants at the incipient stage of systemic necrosis were 214·4 and 203·8 respectively, eight days later 133·3 and 155·2, and 23 days after the first count only 14·8 and 19·1. The virus was shown by comparative tests to reach a higher concentration in cells showing systemic necrosis than in those of recovered leaves. Recovery from the effects of Brazilian tobacco streak is considered to result from a mechanism which reduces the concentration of the virus below a critical level in the cells of newly formed leaves after it reaches the growing point of the plant [cf. ibid., 29, p. 438].

Uschdraweit (H. A.). **Die Bedeutung des Tabakmosaikvirus und des Kartoffel-X-Virus für den Tomatenanbau.** [The importance of the Tobacco mosaic virus and Potato virus X in Tomato cultivation.]—*Angew. Bot.*, 26, 3–4, pp. 118–129, 1952.

The reductions in German tomato crops due to tobacco mosaic virus, potato virus X, and a combination of the two (resulting in streak) are heavy [see next abstract], even when the symptoms are largely masked. For instance, in an experiment at the Biological Institute, Berlin-Dahlem, comprising a number of leading commercial varieties, together with a few selections and botanical forms (58 in all), the average yields (in kg. per plant) of the varieties were as follows: healthy 2·7 (taken as 100), inoculated with tobacco mosaic+potato virus X 0·06 (2·2 per cent.), tobacco mosaic 1·9 (70·9), potato virus X 2·1 (76·9), and a yellow strain of tobacco mosaic virus [*R.A.M.*, 15, p. 321 *et passim*] 1·8 (67·5).

More than half the brands of cigarettes examined were found to harbour virus infection, the incidence of which was particularly high (70 per cent.) in Virginians; cigars and pipe tobacco were also heavily contaminated.

Using *Nicotiana sylvestris* as a test plant, strains of tobacco mosaic virus may be divided into two groups [ibid., 26, p. 32; 29, p. 197]. One (Sn) induces on leaves inoculated by rubbing with infective sap the development of necrotic, primary lesions, which remain localized, while the other (Ss) becomes systemic in the plant without a preliminary local attack. So far, tomatoes in commercial plantings have

yielded exclusively Sn strains, while samples of cigarettes and cigars contained either Ss alone or both. All the tobacco mosaic virus strains studied up to the present have caused substantial losses in tomato production. In one test, for instance, where the yield of uninoculated tomato plants (in kg. per plant) was 3 (= 100 per cent.), the corresponding figures for those inoculated with Sn, Sn+Ss, and Ss were 2·17 (72·3), 2·45 (81·7), and 2·453 (81·8), respectively.

Uschdraweit (H. A.). **Viruskrankheiten der Tomaten.** [Tomato virus diseases.]—*Phytopath. Z.*, 18, 2, pp. 231–245, 11 figs., 1951.

The incidence of tomato viroses is stated to have been on the increase in Germany of recent years, especially in the vicinity of cities like Berlin and Hamburg. The most important are mosaic (tobacco mosaic virus) and streak (the same in combination with potato virus X) [see preceding abstract] and a bunchy or dwarf disease, possibly caused by cucumber mosaic virus [cf. *R.A.M.*, 31, p. 580]. This disease is characterized by a conspicuously thick-set habit, most of the leaves being abnormally small, more or less malformed, and reddish-tinted. Growth is arrested and few or no flowers or fruits are produced. In experiments at the Biological Institute, Berlin-Dahlem, the virus was transmitted to tomato by grafting and by rubbing with infected sap; it induced on tobacco, *Nicotiana glutinosa*, and *Datura metel* a more or less pronounced curvature and irregular, pale to yellowish-green discoloration of the leaf blade. External symptoms, however, are virtually absent from plants inoculated by rubbing during the summer and autumn.

The damage caused by tobacco mosaic plus potato X viruses is appreciable [loc. cit.] and increases in proportion to the earliness of infection.

As the term 'fern leaf' [cucumber and tobacco mosaic viruses: ibid., 17, p. 354; 31, pp. 463, 580] is applied to symptoms caused by both tobacco and cucumber mosaic viruses, the author considers it to be too ill-defined to serve as an indicator of any particular virus.

Costa (A. S.), Forster (R.), & Fraga (G.). **Contrôle de vira-cabeça do Tomate pela destruição do vetor.** [Control of Tomato spotted wilt by destruction of the vector.]—*Bragantia*, 10, 1, pp. 1–9, 1 fig., 1950. [English summary.]

In tests with four insecticides at the Campinas Experiment Station, São Paulo, Brazil, to determine the practicability of combating tomato spotted wilt virus [*R.A.M.*, 31, p. 405] by the extermination of the thrips vector, *Frankliniella* [*paucispinosa*], rhodiatox (the Brazilian trade name for a commercial preparation similar to parathion [ibid., 30, p. 250], containing 5 per cent. *p*-nitrophenyl diethyl thionphosphate) gave the most promising and consistent results. Next in order of efficiency came hexason 2540 M (a mixture of BHC with 2 per cent. gamma isomer, 5 per cent. DDT, and 40 per cent. wettable sulphur).

Based on the results of these experiments, a spraying programme for the control of the disease is proposed, using rhodiatox at 0·25 to 0·5 per cent. in the seed-bed, 0·5 per cent. in the transplantation plots, and 0·5 to 1 per cent. in the field, the corresponding dosages for hexason 2540 M being 0·15, 0·15, and 0·25 per cent., respectively. For both preparations the intervals between treatments should be three to five days in the seed-bed and transplantation plots and five to seven in the field.

Evans (J. A.). **Manzate on Tomatoes and Potatoes.**—*Food Pack.*, 33, 6, pp. 40, 52, 54, 1 fig., 1952.

In 1951 State and Federal investigators in the United States, Hawaii, Canada, and Mexico tested Du Pont's manzate (manganese ethylene bisdithiocarbamate) [*R.A.M.*, 31, p. 392] against a variety of diseases on different crops, with the result that Maryland, Iowa, Illinois, Ohio, and Virginia definitely recommended the use

of the fungicide during the current season, while in other cases growers were advised to apply it on portions of their fields. The standard rate of application is 1½ to 2 lb. per 100 gals. spray. Some data are cited from test plots where manzate was officially evaluated. Thus, in Pennsylvania the percentages of anthracnose [*Colletotrichum phomoides*: loc. cit.] in untreated and manzate-sprayed tomato plots were 18 and 4·3, respectively, defoliation 76 and 15, and yields 10 and 17·4 tons per acre, while in three locations in Ohio the corresponding figures for the untreated and treated plots were as follows: (1) anthracnose 2·5 and 0·2, defoliation 84 and 30, and yields 5·9 and 22·5; (2) 3 and 0·4, 71 and 31, and 10·4 and 18·1; (3) 5·5 and 1·4, defoliation not estimated, and 10·2 and 27·2. In Iowa the percentages of defoliation due to early blight [*Alternaria solani*] in the untreated and sprayed sections of potato fields were 81 and 43, respectively, and the acre yields 312 and 427 bush.; in Ohio, where both *A. solani* and late blight [*Phytophthora infestans*] were present, the incidence of defoliation in the control and sprayed sections was 80 and 15 per cent., respectively, and the yields 428 and 569 bush., the corresponding figures for Delaware (both diseases) being 89 and 38 and 208 and 276, and for the same State (severe late blight only) 91 and 2 and 339 and 537.

Toxicity studies have shown manzate to be in the same range as other dithiocarbamate fungicides. It is compatible with most insecticides in common use, but its combination with mercury or copper compounds, or with lime, may result in the formation of fungicidally inferior salts.

McNaught (K. J.) & Gdanitz (L. C.). **Magnesium deficiency in glasshouse Tomatoes.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 1, pp. 82–91, 1 fig., 1952.

Magnesium deficiency was found to be responsible for severe leaf symptoms in Potentate glasshouse tomatoes [*R.A.M.*, 28, p. 144; 29, p. 587, and next abstract] at Hamilton, New Zealand, in 1948 and 1949. A distinct interveinal chlorosis developed irregularly over the lower leaves; large necrotic, reddish-brown areas appeared and the leaves finally shrivelled. Early symptoms were usually observed after the third or fourth truss had set, or in some plants after the first. The laminae of mid-stem leaves were found to be the best material for diagnostic tissue tests at the Rukuhia Soil Research Station, Hamilton. Magnesium levels below 200 p.p.m., determined on 2 per cent. acetic acid extracts of the crushed laminae, or total levels below 0·4 per cent. in the dry matter of whole leaves were associated with chlorosis. According to tissue tests, quick test analyses of soils from the Auckland district, and reports of similar symptoms in glasshouses in the Dunedin, Christchurch, and Palmerston North areas, magnesium deficiency in glasshouse tomatoes may be widespread in New Zealand. The incidence of chlorosis so far investigated has been consistently associated with very high soil potassium and low or medium magnesium [cf. ibid., 22, p. 82; 25, p. 480].

McNaught (K. J.) & Gdanitz (L. C.). **Ground serpentine, an effective source of magnesium for glasshouse Tomatoes.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 1, pp. 126–130, 1952.

At the Rukuhia Soil Research Station, Hamilton, New Zealand, ground serpentine (35 per cent. magnesium oxide) applied at the rate of 15 tons per acre to magnesium deficient soil prevented the development of magnesium deficiency symptoms in glasshouse tomatoes [see preceding abstract] and gave increased yields of high quality fruit.

Baxter (D. V.). **Pathology in forest practice. Second edition.**—xiii+601 pp., 185 figs., 21 diags., 11 graphs, 8 maps, New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1952. 60*s*.

Since the publication of the first edition of this treatise [*R.A.M.*, 24, p. 126],

advances have been made in the understanding of several important problems in forest pathology, and the new developments are incorporated here. Among them may be mentioned pole blight of pine in the northern Rocky Mountains [ibid., 31, p. 306]; die-back of birch in New England [cf. ibid., 30, p. 350 and below, p. 43]; little leaf of pine in the Piedmont area of the southern States [ibid., 31, p. 360]; the prominence of virus diseases, e.g., phloem necrosis of elm [ibid., 30, p. 636 and below, p. 43]; the effective use of timber preservatives and chemicals for stain and mould control; and the influence of insects on fungi and disease, site selection, and cultural practices.

Gilman (J. C.) & Wadley (B. N.). **The ascigerous stage of Septoria querceti Thuem.**—*Mycologia*, 44, 2, pp. 216–220, 1 pl., 1952.

Leaf spot of oak, particularly of the red oak group, occurs frequently throughout Iowa. The scattered, circular spots are 2 to 3 mm. in diameter and have a dark brown margin and a straw-coloured centre with pycnidia of *Septoria querceti*. In 1941 overwintered leaves from an infected tree bore perithecia containing asci and ascospores of a *Mycosphaerella*. In 1947 mature perithecia were again obtained, and cultures from single ascospores on potato dextrose agar produced pycnidia and pycnidiospores resembling those produced by conidial isolates from the spots. The perithecia on the overwintered leaves were globose with a short papillate ostiole, 156 to 208 (182·6) μ in diameter. The asci were 60 to 70 by 8 to 10 (68·2 by 8·75) μ, and the ascospores 25 to 29 by 3·5 to 4 (27·5 by 3·6) μ. The fungus is named *M. psilospora* n.sp.

Schuldt (P. H.). **Anthracnose fungi on Sycamore and Oak in Iowa.**—*Iowa St. Coll. J. Sci.*, 26, 2, pp. 279–280, 1952.

In a study at the Department of Botany and Plant Pathology, Iowa State College, anthracnose fungi isolated from infected oaks and plane trees (*Platanus occidentalis*) fell into two well-defined groups. The plane group included conidial isolates from plane, white oak (*Quercus alba*), and burr oak (*Q. macrocarpa*), and also perithecial stages on overwintered leaves of white oak and plane, all of which were included in *Gnomonia veneta* (Speg. & Sacc.) Klebahn [= *G. platani*: *R.A.M.*, 31, pp. 89, 638]. The oak group, in which the conidia were larger and more uniformly shaped, included only conidial isolates from red oak (*Q. borealis*), white oak, American elm (*Ulmus americana*), and black walnut (*Juglans nigra*). The groups also differed in their cultural characters. Conidia of the oak group type were never obtained from single ascospore cultures. Isolates of the plane type from plane and isolates of the oak type from white oak were both able to infect white oak and plane. Although there was some evidence that the oak group was closely related to *G. veneta* it is proposed that these forms be referred to *Gloeosporium quercinum* [ibid., 4, p. 1; 6, p. 8] until proof of their identity is more definitely established.

All isolates of the oak group tested were completely deficient for inositol and partially so for thiamin. Two strains were distinguished within the plane group: isolates from plane showed almost complete biotin deficiency and partial thiamin and inositol deficiency, although there was some evidence that inositol partially replaced biotin, while isolates from white oak grew without the addition of vitamins to the basal medium, though growth was better with them. Thiamin increased the sporulation of all isolates tested. Oleic and linoleic acid emulsions and sodium oleate solutions (pH 7·5) stimulated spore germination in both groups. Optimum pH for germination in a representative isolate of the oak group appeared to be 4 to 5 at 97 per cent. relative humidity.

For the first time the plane fungus was shown to grow from infected leaves to healthy twigs and cause twig blight, and from infected twigs to healthy leaves, giving rise to leaf blight.

In a replicated test on planes in 1950, anthracnose was controlled effectively by four applications of Bordeaux mixture.

Walter (J. M.), Rex (E. G.), & Schreiber (R.). **The rate of progress and destructiveness of canker stain of Plane trees.**—*Phytopathology*, 42, 5, pp. 236–239, 1952.

In the oldest known centre, at Gloucester, New Jersey, of the canker stain disease of the London plane tree (*Platanus acerifolia*), caused by *Endoconidiophora* [*Ceratocystis*] *fimbriata* f. *platani* Walter n.f. (differing from the species only in its pathogenicity to *Platanus* spp. [*R.A.M.*, 30, p. 244]), infection is believed to have appeared for the first time in 1926. During the period from 1940 to 1949, the mortality rate, based on the original population, averaged 4·9 per cent. and the annual increase in the number of cases 3·2 per cent. By May, 1949, 87·1 per cent. of the planting had died and a further 4·3 per cent. were infected. From the general trend of the disease in the area under observation it appears that some of the trees have accidentally escaped infection and a few are likely to survive after the outbreak has subsided.

Ames (R. W.). **Tests for Elm phloem necrosis.**—*Plant Dis. Reptr*, 36, 7, pp. 288–291, 1952. [Multilithed.]

When Lindner's rapid chemical test for plant virus diseases (*Science*, 107, pp. 17–19, 1948) [cf. *R.A.M.*, 31, p. 127] was used to detect the presence of phloem necrosis virus in elm [cf. above, p. 42], there was no difference in reaction between bark samples from healthy and diseased trees or between twig samples from healthy, diseased, and recovered trees. Results with frozen leaf tissue were erratic and with fresh leaves rather consistent. The colour was more pronounced in the leaf tests when the disks contained midrib rather than lamina alone. Results with the leaf staining technique [ibid., 29, p. 602] suggested that it may be used to distinguish healthy from affected elms, though further study is required to determine its reliability in detecting diseased trees before symptoms become apparent. The ferric chloride and ceric nitrate tests for phenols and enols both failed, as did Simonds and Bodine's peach mosaic test [ibid., 22, p. 439]. Colour indication tests based on differences in pH were also unsuitable.

Morris (R. F.). **Tree injection experiments in the study of Birch dieback.**—*For. Chron.*, 27, 4, pp. 313–329, 2 figs., 1951. [Received November, 1952.]

Experiments were carried out in New Brunswick in 1943 and 1944 to determine whether tree injection techniques [*R.A.M.*, 28, pp. 357, 508] would be useful for diagnostic purposes in determining the causes of birch die-back [ibid., 31, p. 52 and above, p. 42], one aspect being the injection of nutrient solutions to determine whether the initial symptoms are associated with nutrient deficiencies. Since the tolerance of birch to injected chemicals was found to be a function of crown size, trees equal in this respect were selected for treatment. About 40 gm. of a salt containing nitrogen, potassium, or phosphorus was the maximum that could be injected with safety in dry weather. Trees thus treated when showing initial symptoms displayed no improvement in leaf colour or in radial growth during the same or the following year.

Sabet (K. A.). **A discussion on the cause of the bacterial die-back and canker disease of Poplar.**—*Ned. BoschbTijdschr.*, 24, 5, pp. 126–129, 1952. [Dutch summary.]

The results of the author's studies at the Botany School, Cambridge, showed that bacterial die-back and canker of poplar are caused by *Pseudomonas syringae* f.sp. *populea* [*R.A.M.*, 31, p. 260], closely resembling both *P. rimifaciens* [ibid.,

30, p. 293] and *P. syringae* [ibid., 26, p. 221]. The sole bacteriological difference between the poplar pathogen and *P. syringae* is the strictly aerobic character of the former. The two are also very similar in their operation and host range, but the poplar organism requires the presence of slime in order to produce symptoms resembling those due to *P. syringae* alone. Moreover, *P. syringae* is unable to cause aggressive perennial infection in the poplar. The transient local necrosis of the branches caused by aqueous suspensions of *P.s.* f.sp. *populea* is regarded as an atypical symptom in contradistinction to the virulent and persistent infection induced by natural slime or the same substance produced under aseptic conditions and containing the bacterium in a pure state. Suspensions of pure cultures in the sterile filtrate of centrifuged slime cause both typical and atypical symptoms, but the former developed in only about 40 per cent. of the inoculations on *Populus trichocarpa* in May. The bacteria in the exudate are capsulated and withstand desiccation for a long period. The reaction of the fresh slime is neutral to slightly alkaline and it contains soluble salts, carbohydrates, traces of simple organic nitrogenous compounds, and also a toxic substance and two pectic enzymes, lamellase and pectinase, whereby it liquefies pectate gel completely and irreversibly. Culture of the bacteria on a pectin-containing medium, enriched by an amide such as asparagine, or the toxic substances, or adjustment of the pH to 7 to 8 somewhat exhances pathogenicity. It was shown that no single constituent of the slime could produce the typical symptoms of die-back and canker, for which all the components are presumably essential. Evidence against the primary or essential role of frost in the etiology of the disease is briefly adduced. Artificial freezing tests showed that the damage caused by a well-established infection may be increased, but on the other hand, the occurrence of frost shortly after an attack inhibits the progress of the pathogen. The spread of infection is retarded by high temperature.

Perišić (M.). **Nova virusna bolest na kanadskoj Topoli kod nas.** [A new virus disease of Canadian Poplar in our country.]—*Šumarstvo* [*Forestry*], 4, 5, p. 313, 1951. [Abs. in *For. Abstr.*, 13, 5, p. 522, 1952.]

A virus disease similar to that observed by Atanasoff in Bulgaria [*R.A.M.*, 14, p. 462] occurred on *Populus canadensis* in Belgrade during 1950 to 1951. It is characterized by local foliage chlorosis in June and by a distinct greenish-yellow chlorotic flecking, giving a mottled appearance; this eventually turns yellow and darkens. Diseased leaves fall prematurely.

Domański (S.). **Zgnilizny odziomkowe Sosny zwyczajnej i próba oceny ich warunków rozwojowych.** [Butt rots of Scots Pine and an attempt to estimate their developmental conditions.]—*Sylwan*, 96, 1, pp. 5–30, 1952. [Abs. in *For. Abstr.*, 13, 5, p. 520, 1952.]

In investigations on butt rot in six Scots pine stands ranging from 69 to 119 years old on sandy loam soil [in Poland], 367 out of 969 heartwood disks showed rot, the organisms isolated, in descending order of frequency, being *Polyporus circinatus* [*R.A.M.*, 30, p. 205], *Fomes pini* [ibid., 30, p. 390], *Sparassis crispa* [ibid., 26, p. 479], *P. schweinitzii* [ibid., 26, p. 433; 30, p. 85], *Armillaria mellea* [ibid., 30, p. 349], and *F. annosus* [ibid., 31, pp. 412, 640]. The incidence of the two first-mentioned species was distinctly low in one 73-year-old stand on sandy soil over clay registering pH 5·4 at a depth of 1 m., but very high in five other stands on sandy loam soil at pH 6·2 to 6·6. It is suggested that *P. circinatus* attacks only by way of deep roots; it is a constant component of the Scots pine biocoenosis and causes losses in the older age groups of this species.

Němec (A.). **Studie o hadcové lesní půdě se zřetelem k jejímu obsahu chromu a resorbci chromu krnícím porostem Borovice.** [Study of a serpentine forest soil

with regard to its chromium content and the uptake of chromium by a stunted Pine stand.]—*Sborn čsl. Akad. zeměd.* [= *Acad. tchécosl. Agric.*], 24, 5, pp. 395–404, 1951. [Abs. in *For. Abstr.*, 13, 5, p. 515, 1952.]

The poor growth of pine in the serpentine soils of the Bystrina forest range, Czechoslovakia, is related to a high chromium content in the upper layer [*R.A.M.*, 19, p. 728; 27, p. 336], amounting to about 5 mg. of citric-acid-soluble chromic oxide per kg. of soil, but is due mainly to excess magnesium [ibid., 31, p. 514].

Huss (E.). **Skogsforskningsinstitutets metodik vid fröundersökningar.** [Procedure in seed testing at the Forest Research Institute.]—*Medd. SkogsforsknInst. Stockh.* 40 (*1951*), 6, pp. 1–82, 34 figs., 1952. [Abridged English translation on pp. 53–82.]

This detailed account of the methods used in testing pine and spruce seeds at the Swedish Forest Research Institute [Stockholm] contains on pp. 40–43 (pp. 75–78 of the English version) various references to [unspecified] fungal decay. The results of experiments on the effect of moulding on germinability showed that it was virtually without effect on seed of high viability but poor seed suffered a substantial reduction of germination. From the results of other experiments, not reported in the present paper, it appears probable that initially weak seeds, further retarded by fungal infection, would fail to grow when sown out-of-doors.

Rough handling of the seed in the de-winging process is the chief cause of damage. Portions of the scale and endosperm were excised from two seed samples, of 91 per cent. germinability, visibly injured in this way, and one lot was inoculated with moulds. In visibly damaged samples and in those both damaged and infected the percentages of germination were 41 and 20, respectively. For invisibly damaged seed from the same source, mould incidence seems to be proportionate to the degree of reduction in the vital functions of the seeds.

Stoate (T. N.). **Nutrition of the Pine.**—*Bull. For. Bur. Aust.* 30, 61 pp., 24 pl., 1 graph, 1 map, 1950 (published 1951). [Received November, 1952.]

This report covers investigations extending over nearly 25 years into the nutrition of pines in Western Australia, where the successful establishment and growth of plantations has been made possible on poor, infertile soils formerly regarded as unsuitable.

At Gnangara *Pinus pinaster* on sand dunes is liable to wilt or die at a height of 18 to 21 ins. two seasons after planting. On the flats between the dunes they wilt at three to four feet. The lower branches die, the leader is short, the season's increment reduced, and the needles, bunched at the branch extremities, are almost bronze in colour and sometimes black at the tips. The dormant buds are minute and expand for a brief period in October. *P. pinaster* grown with superphosphate is also subject to summer death within a few weeks in groups of 40 or 50 trees, while those adjacent on other soil types remain healthy. It also suffers from twisting of the leader and branch extremities along the line of overflow in exceptionally wet winters. Normal growth is eventually resumed if there is no recurrence of the disorder. Analyses showed that this disorder is associated with marked deficiency of potassium [*R.A.M.*, 31, p. 307].

P. pinaster at Myalup is subject to needle yellowing; when severe only the current season's needles are retained, leaving characteristically bare limbs with small terminal tufts of needles. The limbs are flesh-coloured and the whole tree appears malformed. All such trees fail ultimately, their life span depending on the soil type. The abnormal condition of *P. pinaster* at Coolilup is characterized by a usually small and dome-shaped crown, the branch whorls become progressively closer from base to tip, the needles are short, woody, pale yellowish green to near

bronze with brown or red-brown tips, and the bark is grey and abnormally thick for the first few feet. This condition is much the same over the greater part of the area though it carries three distinct strains of *P. pinaster*.

The disorders of *P. radiata* may be summarized as follows. Rosetting develops in very young plantations after the first growing season. The stand appears chlorotic and the needles vary from a moderate green to bright yellow. Malformation and stagnation ensue. Broom bush is characterized by a general yellowing and semi-erect branch development. The needles are sparse and short. Dieback [ibid., 30, p. 591] is characterized by dead leaders and yellow needles between the fourth and eighth year after planting. These three disorders are closely associated and may be variants with age and alteration to site conditions. Yellowing may occur at the end of any summer within the first few years after planting, followed by general unthriftiness. Canopy formation is delayed and the lower branches remain for a much longer time than in normal stands. This type of condition may lead to spindle stand, characterized by a less dense crown than normal and short physical rotation; it affects trees on better soils recovered from yellowing. On very inferior sites, however, yellowing becomes more acute and complete stagnation or 'dead top' occurs, usually six to 15 years after planting. With 'autumn brown top' the leader dies back from 12 to 18 in. to 30 per cent. of the tree height. One to 25 per cent. of the trees may be affected. It commences in the sixth or seventh year before the canopy closes and may recur annually for about ten years. In milder cases a green leader develops from a brown top. In marked dead top there is deficiency of sodium and potassium.

Superphosphate corrected most disorders of *P. pinaster* and on all but the laterite soils was effective against the disorders of *P. radiata* ranging from yellowing to spindle stand and dead top. Hand application was necessary in older stands but in young ones the fertilizer was trickled along the roots with a drill. A solution of commercial zinc sulphate applied from a knapsack tank corrected rosetting, dieback, and broom bush of *P. radiata* and the Myalup complaint of *P. pinaster* (which was also corrected by phosphate). One application of either fertilizer is generally sufficient, the general practice now being to apply superphosphate on planting and zinc a year later.

In the south-east of South Australia zinc [ibid., 24, p. 345] is regularly used as a preventive in standard establishment practice. Spraying with $2\frac{1}{2}$ per cent. zinc sulphate solution at an early age completely prevents leader multiplication caused by low die-back, enabling the site to produce its full volume capacity. A 1936 plantation, sprayed with zinc in 1939, is now ready for thinning and will yield at least 25 loads per acre whereas unsprayed strips will not even produce an intermediate return for many years to come. So far the most promising results with superphosphate have been in the Mt Lofty ranges where zinc has not yet been found beneficial. An unthrifty yellowing condition has been strikingly transformed to a greeen colour with a corresponding increase in growth. At Second Valley Forest, during a period of eight years, stagnating pines treated with superphosphate have put on a height increment of 211 in. as against 48 in. in the untreated trees.

The mycorrhizal fungi are *Rhizopogon* (chiefly *R. luteolus* and sometimes *R. rubescens*) and *Boletus* (*B. luteus* and *B. granulatus*). Fructifications of the latter genus do not appear in stands under 10 to 12 years old.

Ibberson (J. E.) & Streater (H.). **White Pine blight responds to fertilizer applications.**—*Penn. For. Wat.*, 4, 2, pp. 30–31, 46, 1952. [Abs. in *For. Abstr.*, 13, 5, p. 529, 1952.]

In an experiment in Cook Forest, Pennsylvania, white pine (*Pinus strobus*) blight [*R.A.M.*, 29, pp. 235, 589; cf. 31, p. 307] appeared to respond very definitely

and rapidly to applications of complete fertilizer (10–6–4) at a rate of 1 or 2 lb. per in. d.b.h.; 3 lb. was toxic to the trees.

Adams (D. F.), Mayhew (D. J.), Gnagy (R. M.), Richey (E. P.), Koppe (R. W.), & Allen (I. W.). **Atmospheric pollution in the Ponderosa Pine blight area, Spokane County, Washington.**—*Industr. Engng Chem.* (*Industr.*), 44, 6, pp. 1356–1365, 7 figs., 4 diags., 5 graphs, 2 maps, 1952.

Since 1943 ponderosa pine trees in the industrialized area north of Spokane, Washington, have displayed a characteristic reddening of the needles known locally as 'ponderosa pine blight' [cf. *R.A.M.*, 31, p. 135]. The affected area covers some 50 square miles, and the trees within a three-mile area near the centre are dead. As part of a comprehensive investigation at Washington State College, the atmospheric concentration of fluorine and sulphur compounds [cf. ibid., 31, pp. 74, 291] during the growing season of 1950 was determined through the operation of 12 air-sampling stations and a mobile air analysis laboratory. Analysis of rain water samples collected throughout October and November of the same year at 82 locations established the points of origin of the contaminants and the extent of their dispersion. An account is given of how the meteorological and topographical conditions in the blight area control the dispersion of pollutants.

A monthly analysis of over 6,000 pine needles showed that the progressive increase in visible damage was accompanied by a corresponding increase in the fluoride content of the needles. Of the eleven atmospheric concentrations reported to be in the range of 0·02 p.p.m. fluorine or more, all but two were situated within 1·5 miles of the centre of damage, and the rain-water samples confirmed that the major source of fluorides coincides with the centre. Even so, the atmospheric concentrations of gaseous fluorine did not reach the minimum reported to be necessary to produce typical fluorine damage. Also the gaseous sulphur compounds were insufficient to be an independent factor. The possible synergistic effects of sub-damage concentrations of sulphur dioxide mixed with gaseous fluorine compounds require to be investigated before any conclusion concerning the cause of pine blight can be drawn, and it is proposed to carry out controlled fumigation experiments with the present work as a guide.

Wood is wealth.—*Bull. For. Br. Can.* 105, 52 pp., 8 diags., 15 graphs, 1 col. map, 1952.

This bulletin continues the economic review of timber in Canada commenced in *Bull.* 92, published in 1938. It is stated (pp. 11, 13) that the annual depletion of Canadian forests for the period 1940–9 by [unspecified] diseases and insects is tentatively estimated at 500,000,000 cu. ft. out of a total of 3,515,000,000 cu. ft. of merchantable timber taken each year.

Lowe (J. L.). **Perennial polypores of North America. Fomes with coloured spores.** —*Mycologia*, 44, 2, pp. 228–238, 2 pl., 1952.

Descriptive notes with a key to the species are given on the tropical perennial pileate polypores of North America referred by Murrill to *Fulvifomes*. Among them 15 *Fomes* species are recognized by the author, *Fomes melanodermus* var. *tomentosus* on [unidentified] dead wood in Mexico and Costa Rica being reported for the first time in North America.

Mold occurrence and effects on wood.—*Rep. sth. For. Exp. Sta., 1951*, pp. 75–76, 1952. [Abs. in *For. Abstr.*, 13, 5, p. 558, 1952.]

Fresh southern pine [*Pinus* spp.] wood, surface-treated with fluoride solutions [*R.A.M.*, 31, p. 525], develops a luxuriant growth of green mould (*Trichoderma*)

[*viride*: ibid., 31, p. 42 and above, p. 30], remains surprisingly free from decay and sapstain during seasoning, and becomes increasingly permeable to oil and water solutions. Of six hardwoods and one soft, only *Liquidambar styraciflua* responded similarly to pine but to a lesser degree.

In laboratory tests fluorine solutions were less toxic to the mould than to most sapstain and decay agents, therefore elimination of competition is probably the chief reason for its luxuriant growth. Mould development was concentrated in the parenchymatous cells, often leading to their complete breakdown and explaining to a large extent the increased permeability of the wood. The tests also showed that there may be factors other than antibiosis responsible for the absence of deterioration in the treated wood.

VERRALL (A. F.). **Control of wood decay in buildings.**—*Agric. Engng, St. Joseph, Mich.*, 33, 4, pp. 217–219, 2 figs., 1952.

In this paper, presented at the annual meeting of the American Society of Agricultural Engineers at Houston, Texas, in June, 1951, the author summarizes useful information on the principles governing the prevention of fungal decay in wooden buildings and their practical application [*R.A.M.*, 31, p. 583].

Black stem rust quarantine and regulations.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 175, pp. 3–10, 1950.

In this revision of quarantine for and regulations concerning black rust (*Puccinia graminis*) the protection afforded by this quarantine is extended to the entire United States. Interstate movement is prohibited anywhere within the continental United States of all species, horticultural varieties, and hybrids within the genera *Berberis, Mahonia*, and *Mahoberberis* not known to be resistant to infection. Permits are required for interstate movement of species designated by the Chief of the Bureau of Entomology and Plant Quarantine as resistant, including *B. thunbergii* and its resistant horticultural varieties. *B.E.P.Q.* 577 gives a list of *Berberis* and *Mahonia* species and varieties designated as rust resistant. In *S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 177, pp. 33–35, 1950, this list is revised.

Quarantine and other official announcements.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 177, pp. 33–71, 1950.

An addition to Nursery Stock, Plant, and Seed Quarantine, No. 37, United States Department of Agriculture, provides for a new plant inspection technique for imported *Primula* plants, involving the indexing of suspected plants. Importation of these plants from Australia and the British Isles is prohibited as from 15th May, 1950, because of the presence in these two countries of tobacco necrosis virus [cf. *R.A.M.*, 29, p. 510]; *Primula* plants from other countries, except Canada, are admitted for cultivation under supervision for a post-entry quarantine period. A general prohibition is placed on the importation of *Pelargonium* plants (but not cuttings) from all foreign countries as this host is also susceptible to the virus [ibid., 16, p. 418].

The prohibition on the importation of *Lantana* plants from India because of sandal spike disease virus [ibid., 27, p. 585] is lifted and post-entry requirements from other foreign countries are revoked, as the virus does not infect *Lantana*. Full details of these changes are given in the section of this publication dealing with Amendments relating to imported plants (pp. 37–38).

B.E.P.Q. 375, 3rd Revision (pp. 53–59) deals with Plant Quarantine Import Restrictions in Egypt, and gives a list of plant pathogens, mostly not yet detected in the country, which are declared injurious and incurable and to be destroyed at the port of entry.